On the Dimensions of Discourse Salience

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Dimensions of Salience

- Background
  - Models of salience-based information packaging
    Referring expressions, grammatical roles and word order
- Corpus study 1
  One or two dimensions of salience?
- Corpus study 2
  Forward-looking vs. Backward-looking salience?
- Discussion
Background: Linguistic Variability

- “[E]s darf nicht verkannt werden, dass man denselben Sinn, denselben Gedanken auch verschieden ausdrücken kann, wobei denn also die Verschiedenheit ... nur eine der ... Färbung des[selben] Sinnes ist und für die Logik nicht in Betracht kommt.‘
  (Frege 1892)

- “[W]e must not fail to recognize that the same sense, the same thought, may be variously expressed; thus the difference does ... concern ... only the ... colouring of the [same] thought, and is irrelevant for logic.’
  (Geach and Black 1980)

⇒ Linguistic variability cannot be (completely) accounted for on grounds of (Fregean) Semantics
  ⇒ “Information Packaging”
Information Packaging

- "the kind of phenomena ... that ... have to do primarily with how the message is sent and secondarily with the message itself’"
  (Chafe 1976)

- "the linguistic dimension that allows speakers to make structural choices in accordance with their assumptions about the hearer’s communicative state, and that allows hearer to decode the import of those structural choices appropriately.’"
  (Vallduví 1994)
Information Packaging

- (a) the noun may be either **given** or **new**;
- (b) it may be a **focus of contrast**;
- (c) it may be **definite** or **indefinite**;
- (d) it may be the **subject** of the sentence;
- (e) it may be the **topic** of the sentence;
- (f) it may represent the individual whose **point of view** the speaker takes, or with whom the speaker **empathizes**

(Chafe 1976)
Many aspects of information Packaging have been explained on grounds of „salience“

- (a) the noun may be either given or new;  
  (Sgall et al. 1986; Prince 1981)

- (b) it may be a focus of contrast;  
  (Langacker 1997)

- (c) it may be definite or indefinite;  
  (Lewis 1979)

- (d) it may be the subject of the sentence;  
  (Fillmore 1977)

- (e) it may be the topic of the sentence;  
  (Sgall et al. 1986; Grosz et al. 1995)

- (f) it may represent the individual whose point of view the speaker empathizes
  (Chafe 1976)
Information Packaging

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- (f) it may represent the individual whose point of view the speaker empathizes (Chafe 1976)

Many aspects of information Packaging have been explained on grounds of „salience“

... but what exactly is it, and what effects does it have?
What is salience?

- Well, different people have different ideas

... but it is generally accepted that

- salience has to do with attention and memory
- salience plays a crucial role in selection tasks
- this includes the information packaging of discourse referents
  - referring expressions: pronominal > nominal
  - grammatical roles: subject > object > oblique
  - word order: salient precedes non-salient
Two views on salience of discourse referents

Monodimensional

- Realization of referent in preceding discourse
- Attentional states
- Accessibility in memory
- Information Packaging
- Grammatical roles
- Referring expressions
- Word order

Multidimensional

- Realization of referent in preceding discourse
- Based on shared knowledge, e.g., about the preceding discourse
- Salience factors
- Backward-looking
- Grammatical roles
- Referring expressions
- Word order
- Information Packaging
- Forward-looking
- Salience factors
- Sensitive to speaker-private intentions, e.g., with respect to the subsequent discourse
- Information Packaging

(Sgall et al. 1986, Tomlin 1995, 1997)

One or two dimensions of salience?

- Background
  - Salience influences information packaging, pronominalization, subject role, sentence-initial position

- **Corpus study 1**
  One or two dimensions of salience?

- Corpus study 2
  Forward-looking vs. Backward-looking salience?

- Discussion
Salience in discourse

- Corpus study
- German
  - Grammatical roles and word order less dependent on each other than in English
- TüBa-D/Z
  - 2,213 newspaper articles
  - Syntax + coreference annotation
- Features
  - perspron (personal pronoun)
  - sbj (subject role)
  - vf (vorfeld, sentence-initial topological field)

(Telljohann et al. 2009, Naumann 2007)
Salience in discourse

- **Feature extraction**
  - Prolog conversion of TüBa-D/Z
    (Bouma 2010)
  - non-coordinated, non-embedded main clauses
    40,713 clauses
  - all nominal and pronominal arguments and adjuncts
    79,222 (potential) referring expressions

- **packaging phenomena**
  - perspron $\Leftrightarrow$ pos="PPER"
  - sbj $\Leftrightarrow$ func=/on|onk/
  - vf $\Leftrightarrow$ cat="VF"

- **discourse features**
  - given $\Leftrightarrow$ link* to preceding discourse
  - important $\Leftrightarrow$ link* to subsequent discourse

*“coreferential“, „anaphoric“, „bound“, „cataphoric“ or „instance“ relation
One or two dimensions?

- Monodimensional prediction
  - Salience understood as a latent variable
    - Can be extrapolated from information packaging
    - Extrapolation is imprecise
      - Other (semantic, socio-cultural, etc.) factors have an influence on the realization of the referent
    - Reliability of the extrapolation increases, if multiple dimensions of information packaging are taken into consideration
      - If they indicate the same salience status
One or two dimensions?

- Monodimensional prediction

- Salience-marking grammatical devices
  - Pronominalization (perspron)
  - Subject role (sbj)
  - Sentence-initial position (vf)

- Prediction 1
  - Salience has an effect on information packaging
    - $\text{sbj} \Rightarrow \text{salient} \Rightarrow \text{perspron}$
    - $\Rightarrow \text{sbj} \Rightarrow \text{perspron preference}$

\[ P(\text{perspron|sbj}) > P(\text{perspron}) \]
One or two dimensions?

- Monodimensional prediction

- Prediction 2
  \[ P(X^{\text{sal}} | Y^{\text{sal}}, Z^{\text{sal}}) \geq P(X^{\text{sal}} | Y^{\text{sal}}) \]
  - salience extrapolation from \( Y \) and \( Z \)* is more reliable than extrapolation from \( Y \) alone
    - \( \text{sbj} \implies \text{salient (low confidence)} \implies \text{perspron} \)
    - \( \text{sbj and vf} \implies \text{salient (high confidence)} \implies \text{perspron} \)

\[ P(\text{perspron} | \text{sbj,vf}) \geq P(\text{perspron} | \text{sbj}) \]

* Given that \( Y^{\text{sal}} \) and \( Z^{\text{sal}} \) point to the same degree of salience
One or two dimensions?

- Multidimensional prediction

- Prediction 1 may hold
  - But only if $X^{\text{sal}}$ and $Y^{\text{sal}}$ are affected by the same dimension of salience

- Prediction 2 does not hold
  - If $X^{\text{sal}}$ is determined by one dimension of salience and $Y^{\text{sal}}$ by another dimension of salience

\[ P(X^{\text{sal}} | Y^{\text{sal}}) > P(X^{\text{sal}}) \]
\[ P(X^{\text{sal}} | Y^{\text{sal}}, Z^{\text{sal}}) \geq P(X^{\text{sal}} | Z^{\text{sal}}) \]
One or two dimensions?

Prediction 1

Probability increase confirmed

- if there are multiple dimensions of salience, they are interrelated

\[
P(X_{\text{sal}} | Y_{\text{sal}}) > P(X_{\text{sal}})
\]

| realization \( X_{\text{sal}} \) | condition \( Y_{\text{sal}} \) | (conditioned) probability \( P(X_{\text{sal}} | Y_{\text{sal}}) \) | probability increase (vs. unconditioned) |
|-----------------|-----------------|-----------------|-----------------|
| perspron        | (none)          | 10.80% (8,557/79,222) | +0.63%          |
|                 | vf              | 11.43%           |                 |
|                 | sbj             | 20.06%           | +9.26%          |
| sbj             | (none)          | 42.50% (33,667/79,222) | +36.44%         |
|                 | perspron        | 78.94%           |                 |
|                 | vf              | 63.91%           | +21.41%         |
| vf              | (none)          | 33.16% (16,789/79,222) | +1.92%          |
|                 | perspron        | 35.08%           |                 |
|                 | sbj             | 49.87%           | +16.71%         |

Significant positive correlation between perspron, sbj, vf

<table>
<thead>
<tr>
<th>realization</th>
<th>( \chi^2 )</th>
<th>( \phi )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \pm )perspron ( \pm )vf</td>
<td>( p &lt; .0001 )</td>
<td>.014</td>
</tr>
</tbody>
</table>
One or two dimensions?

Prediction 2

\[ \Pr(X_{\text{sal}} | Y_{\text{sal}}, Z_{\text{sal}}) \geq \Pr(X_{\text{sal}} | Z_{\text{sal}}) \]

- \( \Pr(\text{perspron} | \text{vf, sbj}) < \Pr(\text{perspron} | \text{sbj}) \)
- \( \Pr(\text{vf} | \text{perspron, sbj}) < \Pr(\text{vf} | \text{sbj}) \)
- **Direct counterevidence** for monodimensional models of salience
Forward-looking/backward-looking?

- **Background**
  - Salience influences information packaging, pronominalization, subject role, sentence-initial position

- **Corpus study 1**
  - (at least) two dimensions of salience

- **Corpus study 2**
  - Forward-looking vs. Backward-looking salience?

- **Discussion**
Forward-looking/backward-looking?

### Multidimensional models of salience

<table>
<thead>
<tr>
<th>Model</th>
<th>Definition</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>„anaphoric“ (backward-looking)</td>
<td>Defined with respect to the preceding discourse / shared knowledge</td>
<td>(Givón 1983, 2001)</td>
</tr>
<tr>
<td>„givenness“</td>
<td></td>
<td>(Clamons et al. 1993, Mulkern 2007)</td>
</tr>
<tr>
<td>„anaphora“</td>
<td></td>
<td>(Ehlich 1982, Cornish 2007)</td>
</tr>
<tr>
<td>„cataphoric“ (forward-looking)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>„foregrounding“</td>
<td></td>
<td></td>
</tr>
<tr>
<td>„anadeixis“ (attention guidance)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Attention-shifting operations / preparation for subsequent discourse
Forward-looking/backward-looking?

„backward-looking“
Covers most salience factors that are accessible to the hearer
Salience ~ attention:
Approximates attentional states of the hearer

„forward-looking“
Includes sources of information that are available to the speaker only
For example, his/her intentions for the development of subsequent discourse

Can be partially reconstructed from

Realization and distribution of the referent in previous discourse
Defined with respect to the preceding discourse / shared knowledge

Realization and distribution of the referent in subsequent discourse
Attention-shifting operations / preparation for subsequent discourse

Generic labels
General characterization
Heuristic measurements
Functions
Forward-looking/backward-looking?

„backward-looking“

± given
previous mention

Realization and distribution of the referent in previous discourse

Defined with respect to the preceding discourse / shared knowledge

„forward-looking“

± important
subsequent mention

Realization and distribution of the referent in subsequent discourse

Attention-shifting operations / preparation for subsequent discourse

Robust, coarse-grained heuristic measurements

Abstract from theory-specific details

Different measurements with a variety of factors have been proposed (cf. Chiarcos 2010 for an overview)
Forward-looking/backward-looking?

„backward-looking“  „forward-looking“

±given previous mention
±important subsequent mention

Robust, coarse-grained heuristic measurements

Extrapolated from coreference annotation in TüBa-D/Z

<table>
<thead>
<tr>
<th>realization</th>
<th>±given</th>
<th>±important</th>
</tr>
</thead>
<tbody>
<tr>
<td>±perspron</td>
<td>$p &lt; .0001$</td>
<td>.342</td>
</tr>
<tr>
<td>±sbj</td>
<td>$p &lt; .0001$</td>
<td>.288</td>
</tr>
<tr>
<td>±vf</td>
<td>$p &lt; .0001$</td>
<td>.065</td>
</tr>
</tbody>
</table>

Significant and positive correlation between heuristic measurements and packaging phenomena

But how do ±given and ±important interact?
Forward-looking/backward-looking?

- How do ±given and ±important interact?
  - Experiment with C4.5 decision trees to predict packaging preferences from only ±given and ±important

(a) referring expressions  (b) grammatical roles  (c) word order

+given
| +important: perspron
| -important: defNP
-given: defNP

+given: sbj
-given
| +important: sbj
| -important: other

+given: mf_initial
-given
| +important: vf
| -important: mf_noninitial

Important here is not the quality of the classification, but the predicted effects of ±given and ±important on information packaging.
### Packaging predictions

<table>
<thead>
<tr>
<th>+given</th>
<th>+important</th>
<th>-important</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal pronoun Subject Mittelfeld initial</td>
<td>Definite NP Subject Mittelfeld initial</td>
<td></td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>-given</th>
<th>+given</th>
<th>Definite NP Oblique Mittelfeld non-initial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definite NP Subject Vorfeld</td>
<td></td>
<td></td>
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This distribution explains the observations of first corpus study:

- correlation between pronominalization and subject (+important, +given)
- correlation between vorfeld and subject (+important, -given)
- dispreference for subject pronouns (+given) in vorfeld (-given)

±given and ±important account for the observed distribution of grammatical devices
Discussion

- Background
  ⇒ salience influences information packaging

- Corpus study 1
  ⇒ (at least) two dimensions of salience

- Corpus study 2
  ⇒ these dimensions may be forward-looking and backward-looking salience
    ±given and ±important account for the observed distribution

• Discussion
Results

- If a salience-based approach on information packaging is adopted to account for
  - the choice of referring expressions,
  - the assignment of grammatical roles, and
  - word order preferences in German,
- it is
  - necessary to distinguish (at least) two dimensions of salience in discourse, and
  - possible to model these dimensions as backward-looking salience and forward-looking salience
Related research

• Kaiser & Trueswell (2004, to appear 2011)
  • antecedent selection preferences for personal pronouns and demonstrative pronouns in Finnish
    • Personal pronoun more sensitive to grammatical role
    • Demonstrative pronoun more sensitive to word order
  ⇒ A unified notion of salience cannot be the sole determinant of the choice of referring expressions

• But
  • constraints on the surface realization of antecedent-anaphor pairs are insufficient to disprove the existence of a unified cognitive dimension of salience
An alternative functional explanation

- **one cognitive dimension of salience**
- **salience-based grammaticalization**
  
    - conventional associations between the linguistic realization of the antecedent and the referring expression of the anaphor

- Pronominal anaphors with subject antecedent may evolve into syntactically bound pronouns

- Cf. German relative pronoun *das `that`* from original demonstrative pronoun
Related research

- An alternative functional explanation
  - one cognitive dimension of salience
  - salience-based grammaticalization
  - different antecedent selection preferences for different types of pronouns may reflect different degrees of grammaticalization
    - Conventional associations may apply independently from the actual degree of salience a referent has
Related research

- An alternative functional explanation
  - one cognitive dimension of salience
  - salience-based grammaticalization
  - different antecedent selection preferences for different types of pronouns may reflect different degrees of grammaticalization

⇒ Dimensionality of salience needs to be confirmed independently from the surface realization of the antecedent
Related research

- **Word order in German**
  - "standard view"
    - Vorfeld marks topical (given) referents
    - Indefinite object tend to precede definite subjects in German OVS sentences
  - Speyer (2007)
    - 51% of Vorfeld constituents could neither semantically nor anaphorically linked to the preceding discourse
  - Dipper & Zinsmeister (2009)
    - 55% of Vorfeld constituents stand in no obvious relationship to the preceding discourse
Related research

- **Word order in German**
    - Canonical topic position in German is the Wackernagel position (*Mittelfeld* initial)
    - Pragmatically-driven *Vorfeld* positioning (A‘ movement) requires an additional motivation
      - kontrast
    - If the *Vorfeld* is not occupied by A‘ movement, the highest-ranking *Mittelfeld* constituent is moved in the *Vorfeld* (formal movement)
      - this may be the topic

⇒ Association between (givenness-)topic and *Vorfeld* is secondary

The primary function of the *vorfeld* is not to mark *givenness*
Related research

- Alternative determinants of Vorfeld positioning in German
  - discourse topic status
    Vorfeld constituents refer to the global discourse topic
    (= headline of a biographical article)
  - contrast & frame-setting topics
    primary determinants of Vorfeld positioning
    backward-looking salience (Grosz et al. 1995) is secondary

(Filippova & Strube 2007)
(Speyer 2007)
Related research

- Discourse topic status, contrast and frame-setting are speaker-oriented salience factors
  - speaker-private information (prior to utterance)
  - may belong to the same group of factors as ±important

⇒ Replace backward-looking / forward-looking dichotomy by hearer-oriented vs. speaker-oriented

forward-looking factors do, however, represent only a fraction of possible speaker-oriented salience factors

(Chiarcos 2010)