Computational Representation of Image Schemas in FrameNet

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Presentation Roadmap

- Background
  - Image schemas
  - Grammatical constructions
- Research questions
- Test case
  - Brazilian Portuguese Inceptive Aspectual Cxn.
- Further challenges
  - Mass Quantification Cxn.
Image Schemas

• Recurring dynamic pattern of human perceptual interactions and motor programs, which gives coherence and structure to our experience in the world (Johnson, 1987)

• Directly meaningful, highly schematic and internally structured (Hampe, 2005)

• Play a central role in the study of grammatical constructions in the sense that content words that develop grammatical functions in constructions tend to preserve them (Sweetser, 1988, 1990)
Grammatical Constructions

- Form and meaning pairings
- Rules that license “new” linguistic signs based on other linguistic signs (Fillmore, Lee-Goldman & Romieux, 2012)
- Modeled in FrameNet Constructicons in terms of mothers (the whole construction) and daughters (their constituent parts)
Research Questions

- Provided that grammatical constructions may present combinatorial restrictions between their daughter signs...
- How can we model such combinatorial restrictions in a Constructicon?
- Can Image Schemas offer some aid in this process?
- Does such a model parallel what happens in language use?
Test Case

- The Inceptive Aspectual Cxn. in Brazilian Portuguese (Sigiliano, 2013)
  - \([V_{1\text{fin}} \text{ (prep)} \ V_{2\text{inf}}]\)
  - Evokes the Activity\_start or Process\_start frames
  - The V1 slot can be filled by either canonical or non-canonical aspectual markers
  - Two non-canonical verbs were selected for this experiment: romper ‘break’ and entrar ‘enter’
Test Case

- The Inceptive Aspectual Cxn. in Brazilian Portuguese (Sigiliano, 2013)
  - Maria rompeu a chorar
    Maria break.PAST.3SG to cry.INF
    Maria burst into tears.
  - Pedro entrou a reclamar
    Pedro enter.PAST.#SG to complain
    Pedro started complaining.
### Collocations in the Aspectual Cx

<table>
<thead>
<tr>
<th>V1</th>
<th>Schema</th>
<th>V2 Semantic Types</th>
<th>Frame</th>
</tr>
</thead>
<tbody>
<tr>
<td>romper ‘break’</td>
<td>Removal_of_restraint</td>
<td>Emotion (17 / 65.4%)</td>
<td>Make_noise (???)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Action (5 / 19.2%)</td>
<td>Intentionally_act/affect</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Motion (3 / 11.5%)</td>
<td>Self_motion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Speaking (1 / 3.9%)</td>
<td>Communication</td>
</tr>
<tr>
<td>entrar ‘enter’</td>
<td>Into</td>
<td>Action (36 / 58.1%)</td>
<td>Intentionally_act/affect</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Speaking (11 / 17.8%)</td>
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<tr>
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<td>Motion (7 / 11.3%)</td>
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<td></td>
<td>Emotion (3 / 4.8%)</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Perception (2 / 3.2%)</td>
<td>Perception</td>
</tr>
<tr>
<td></td>
<td></td>
<td>State (1 / 1.6%)</td>
<td>State</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Desiring (1 / 1.6%)</td>
<td>Desiring</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Believing (1 /</td>
<td>Opinion</td>
</tr>
</tbody>
</table>

Semantic types of V2 occuring in Aspectual Cxn. with V1 *romper* and *entrar* in current Portuguese.
Desiring
Perception
Mental activity
Propositional attitude
Speaking
Motion
Action
State
Natural phenomena
Believing
Emotion

Aspectual Cxn. with V1 *entrar* from the 15\(^{\text{th}}\) to the 20\(^{\text{th}}\) centuries
Aspectual Cxn. with V1 *romper* from the 15th to the 20th centuries
The Model

• Relying on the connections between frames and schemas, the model searches for the shortest path between the Image Schema still present in the grammaticalized V1 and the frame evoked by V2.

• Different kinds of connections represent different distance values:
  • Perspective: 0.1
  • Inheritance: 0.2
  • Subframe & Using: 0.3
The Model

• The Shortest Path tool:
  ✓ Source Schema = V1
  ✓ Goal Schema = V2
  ✓ Inheritance:
  ✓ Using:
  ✓ Distance = 0.7
The Hypothesis

• If the semantics of Aspectual Auxiliaries maintains the connection to Image Schemas (Sweetser, 1988, 1990), it could be possible to explain collocation restrictions between V1 and V2 by measuring how close the source Image Schema is from the target frame.

• High frequency V1-V2 collocations should present shorter distances

• Low frequency V1-V2 collocations should present longer distances
# The Results

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</tr>
<tr>
<td>‘break’</td>
<td></td>
<td>Action (5 / 19.2%)</td>
<td>Intentionally_act/affect</td>
<td>0.7/.5</td>
</tr>
<tr>
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<td></td>
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<td>Self_motion</td>
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Semantic types of V2 occuring in Aspectual Cxn. with V1 *romper* and *entrar* in current Portuguese.
Discussion

• Questions:
  • Is Make_noise a good representation for verbs like crying, screaming and so on?
  • Are the distances proposed for each relation balanced properly?
  • Shouldn’t we include metaphor as a link in our model?
    • ACTION IS MOTION
    • EMOTIONS ARE LIQUIDS IN A CONTAINER
More questions?