The principle of canonical orientation revisited: Evidence from Mesoamerican languages


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Outline

• Spatial reference frames and the Principle of Canonical Orientation (POCO)
• MesoSpace: team, goals, tools
• The Ball & Chair study
• Findings
• Discussion
Spatial Frames of Reference

- two kinds of *place functions* (Jackendoff 1983)
  - i.e., functions from reference entities into regions
    - *topological* (Piaget & Inhelder): perspective- or frame-free
      - independent of the orientation of the ground, the observer, and the figure-ground array (the configuration)

(1.1) *The apple is on the skewer*

(1.2) *The band aid is on the shin*

(1.3) *The earring is in the ear (lobe)*
Spatial frames of reference (cont.)

- **projective** – framework-dependent
  - the place function returns a region defined in a coordinate system centered on the reference entity
  - the axes of the coordinate system are derived from an anchor
    - in **intrinsic** frames, the anchor is the reference entity/ground
    - in **relative** frames, it is the body of an observer
    - in **absolute** frames, it is some environmental entity/feature

Fig. 2. The three types of spatial reference frames distinguished in Levinson 1996, 2003

- **Intrinsic**: The ball is front of the chair.
- **Relative**: The ball is to the right of the chair.
- **Absolute**: The ball is east of the chair.
• Reference frames and the interpretation of spatial relators

<table>
<thead>
<tr>
<th>Statement</th>
<th>True in a relative frame?</th>
<th>True in an intrinsic frame?</th>
</tr>
</thead>
<tbody>
<tr>
<td>The ball is in front of the chair</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>The ball is left of the chair</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Fig. 3.** Truth conditions of intrinsic and relative descriptions of Ball & Chair 3.9 (left) and 3.12
The Principle of Canonical Orientation (POCO)

- Levelt (1984, 1996) describes speakers’ preference for use of aligned frames
- Intrinsic use requires canonical orientation of ground object
- POCO predicts a constraint against “disaligned” intrinsic frame use

Fig. 4. A non-canonically positioned chair: #‘The ball is under the chair.’
Experimental research (Carlson-Radvansky & Irwin 1993)

- Participants describe stimuli, allowing them to observe the effects of each frame type in isolation.
- Findings: the selection of vertical relators depends on their cumulative applicability across the three types of frames.

Fig. 5. Percentage of above responses by trial type in experiment 4 of Carlson-Radvansky & Irwin 1993. Trial types are distinguished in terms of the frame types in which ‘above’ is applicable to the stimulus. (The objects shown are not the actual stimuli.) (Levelt1996: 90)
POCO (cont.)

- (gravitational) absolute frames play the strongest role in licensing vertical relators
  - relative frames play the weakest
- 30% of trials supporting “disaligned” intrinsic frames elicited above - in violation of POCO
  - so even in English, POCO is merely a tendency, not an absolute constraint

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POCO (cont.)

• Bohnemeyer & Tucker 2010
  – POCO not always adhered to
  – Yucatec speakers make use of a ground object’s axes and use an intrinsic frame type

An atypical description from English speakers:

(1) # The ball is under the chair.

Yucatec description of Picture 1.6:

(2) Le=bòola=o’, y=àanal te’l tu’x k-u=kutal máak=o’,
    DET=ball=D2 A3=underside DADV where IMPF-A3=sit:INCH.DIS person=D2
    ‘The ball, under (lit. (at) its underside) there where a person sits...’
Research Questions

• How does POCO apply in other (non-English) languages?
• What factors, if any, might influence the applicability of POCO?
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MesoSpace: team, goals, tools

- **Spatial language and cognition in Mesoamerica**
- **13 Mesoamerican (MA) languages** (Campbell, Kaufman, & Smith-Stark 1986)
  - **Mayan**
    - Chol (J.-J. Vázquez)
    - K’anjob’al (E. Mateo)
    - Tseltal (several variants; G. Polian)
    - Yucatec (PI: J. Bohnemeyer)
  - **Mixe-Zoquean**
    - Ayutla Mixe (R. Romero)
    - Soteapanac (S. Gutierrez)
    - Tecpatán Zoque (R. Zavala)
  - **Oto-Manguean**
    - Isthmus (Juchitán) Zapotec (G. Pérez)
    - Otomí (N. Hernández, S. Hernández, E. Palancar)
  - **Huave** (S. Herrera)
  - **Purépecha** (A. Capistrán)
  - **Totonac-Tepehuan**
    - Huehuetla Tepehua (S. Smythe)
  - **Uto-Aztecan**
    - Pajapan Nawat (V. Peralta)
MesoSpace: team, goals, tools (cont.)

- **3 non-MA “controls” & Spanish**
  - Seri (C. O’Meara)
  - Cora (Uto-Aztecan; V. Vázquez)
  - Mayangna (E. Benedicto, A. Eggleston in collaboration with the Mayangna Yulbarangyang Balna)
  - Mexican, Nicaraguan, and Barcelonan Spanish (R. Romero; E. Benedicto, A. Eggleston)

- **2 (interrelated) domains**
  - frames of reference
  - meronyms

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**Fig. 8** The MesoSpace team (most of them)

**Fig. 9** Meronyms in Ayoquesco Zapotec (left) and Tenejapa Tseltal (adapted from MacLaury 1989 and Levinson 1994)
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The Ball & Chair study

• Task for studying reference frame use in discourse
  – a referential communication task: Ball & Chair (B&C)
  – replacing Men & Tree (M&T) in Pederson et al (1998) etc.
  – B&C allows us to discover selection preferences for any of the reference frame types
  – 4 sets of 12 photos; ~5 pairs per population

Fig. 10. Design of the Men and Tree task (Pederson et al. 1998: 562)

Fig. 11. Two of the Ball & Chair photos, featuring an intrinsic contrast
• the present study - B&C data from 11 varieties
  • 6 Mesoamerican languages
    – Yucatec Maya (J. Bohnemeyer)
    – Ayutla Mixe (R. Romero)
    – San Ildefonso Tultepec Otomí (N. Hernández, S. Hernández, E. Palancar)
    – Purépecha (or Tarascan; A. Capistrán)
    – Chacoma Tzeltal (G. Polian)
    – Juchitán (Isthmus) Zapotec (G. Pérez)
  • 2 non-Mesoamerican indigenous languages
    – Seri (C. O’Meara)
    – Sumu-Mayangna (E. Benedicto, A. Eggleston, Mayangna Yulbarangyang Balna)
  • 3 varieties of Spanish
    – from Barcelona (A. Eggleston), Mexico (R. Romero), and Nicaragua (A. Eggleston)
The Ball & Chair study (cont.)

• coding
  – we coded descriptions of the location of the ball
  • distinguishing among eight categories
    – **allocentric (or “disaligned”) intrinsic**
    – egocentric intrinsic (‘direct’; Danziger 2010)
    – egocentric extrinsic = relative
    – intrinsic and relative *aligned* (Carlson-Radvansky & Irvin 1993)
    – geocentric (= geomorphic, landmark-based, or absolute)
    – vertical absolute
    – vertical absolute and intrinsic aligned (Carlson-Radvansky & Irvin 1993)
    – topological (no reference frame involved; Piaget & Inhelder 1956)
The Ball & Chair study (cont.)

– Of the 48 pictures in the set, 10 have configurations that afford POCO violations, where the chair is in non-canonical orientation;

– POCO violations
  • coded as allocentric intrinsic
  • used vertical relators

Fig. 12 Target B&C photos - chairs in non-canonical orientation
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Findings

- POCO violations occur across languages of the sample

Fig. 13 Frequency of POCO violations by linguistic variety

*Fig. 13 Frequency of POCO violations by linguistic variety*
• Fisher Exact test
  – languages differ significantly in their propensity to violate POCO ($p < .001$)
    • i.e. use vertical relators to refer to the ground object’s intrinsic axes, even when said object is in non-canonical orientation

• What factors could contribute to this variation between languages?
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Discussion: Influence of the *Sprachbund*??

• Could POCO violability be an areal feature?

Fig. 14. *Percentage of target photos with POCO violations*
Discussion: Variation an artifact of Intrinsic preference in Mesoamerica?

• Increased POCO violation may be an artifact of increased preference for intrinsic frames

• Compare POCO violations in target items to use of Intrinsic throughout the data set
POCO and Intrinsic use: correlation?

Fig. 15  Percentages of POCO violations in target photos & use of Intrinsic in all photos
POCO and Intrinsic use

• Correlation: 0.567276679

• Approaching significance
  – P-value > 0.05

• Suggests a possible effect
  – (needs additional data)
Discussion: Influence of Meronymy?

• Impact of POCO reduced by the pervasive use of meronyms in encoding spatial relations?
  – E.g. Yucatec àanal bodypart term used to denote a spatial region

Yucatec description of Picture 1.6:

(2) Le=bòola=o’, y=àanal te’l tu’x k-u=kutal
   DET=ball=D2 A3=underside DADV where IMPF-A3=sit:INCH.DIS
   máak=o’, kóoh-ol tu=chan ba’l-il (...) 
   person=D2 hit\MIDDLE-INC PREP:A3=DIM thing-REL
   ‘The ball, under (lit. (at) its underside) there where a person sits (it's) touching (the chair's) thing (...)’

Fig. 6 B&C 1.6
Meronymy Data

• Preliminary results from MesoSpace tasks:
  – Subset of data from the Novel Objects task

Fig. 17 Novel Object Part Identification
Meronymy Data

• Preliminary results from MesoSpace tasks:
  – Subset of data from the Novel Objects task
• Percentage of parts named using meronyms
• If we compare POCO violations to the meronymy usage in languages of the sample, we should see a correlation
POCO and Meronymy

Percentage of POCO violations

Fig. 18  Percentage of POCO violations and use of meronyms
POCO and Meronymy

• Correlation: 0.781261797
• Significant!
  – P-value < 0.01**
• Suggests an effect
Future Directions

• Perform analyses using finalized meronymy results
• Add more languages
• Further investigations of the relationship between meronymy and reference frame use
• Collecting more data using additional Ball & Chair sets
Thanks!
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References


References


