Overview

- ForS and MesoSpace
  - ForS in Seri and Yucatec
  - ForS and vectors
  - ForS reclassified
  - summary

ForS and MesoSpace

- MesoSpace: NSF award #BCS-0723694
  - “Spatial language and cognition in Mesoamerica”
- 15 field workers
- 13 MA languages
  - Mayan
    - Chol (J.-J. Vázquez)
    - Tarascan
    - Purepecha (A. Capistrán)
    - Totonacan
    - Huehuetepec (S. Smythe Kung)
  - Mixe-Zoquean
    - Ayutla Mixe (R. Romero Méndez)
    - Tzeltal (G. Polian)
    - Tzotzil (G. Sepúlveda)
    - Uto-Aztecanc
    - Cora (V. Vasquez)
    - Pajapan Nawat (V. Peralta)
  - Oto-Manguean
    - Otomi (E. Palancar; N. H. Green; S. Hernández-Gómez)

3 controls
- Seri (C. O’Meara)
  - Mayangna (E. Benedicto, A. Eggleston in collaboration with the Mayangna Yulbarangyang Balna)
  - Mexican Spanish (R. Romero Méndez)
- 2 (interrelated) domains
  - ForS and meronyms – labels for parts of entities
    - including, but not restricted to, body part metaphors

Identifying ForS in the data
- Levinson’s (1996) classification entails
  - that the three types of ForS differ in the entity/feature on whose orientation they depend
    - the ground – intrinsic ForS; the observer – relative ForS; an entity or feature in the environment – absolute ForS
  - we call this entity the anchor, following Danziger 2010
Vectors and frames of reference

• the MesoSpace team cooks up trouble for the Levinson classification

(1.1) ... zix c-oqueht quij hant i-ti t-ij.

SER thing SBj: NMLZ-bounce DEF. ART. SG. sit land DEF. ART. SG. lie

3 POSS-on REAL. DEF. sit SR already again church

Cop i-icp hac
DEF. ART. SG. stand 3 POSS-side DEF. ART. SG. LOC

3 POSS-side

• our argument
- (1.1) involves a previously unrecognized fourth type of FoR – head-anchored FoRs
- the proper classification of (1.1) presupposes an in-depth look at the role FoRs play
- not just in locative descriptions,

but also in orientation descriptions
- the critical notion that bridges between these uses

is that of vectors
- we base our discussion on MesoSpace data from Seri and Yucatec

Overview

• FoRs and MesoSpace
  • FoRs in Seri and Yucatec
  • FoRs in Seri and Yucatec (cont.)
  • FoRs in Seri and Yucatec (cont.)
  • FoRs and vectors
  • FoRs reclassified
  • summary

FoRs in Seri and Yucatec

• we ran the Ball & Chair (B&C) task with five pairs of speakers per language
- in the following, we are drawing on a corpus of
  • 3 x 4 x 12 = 240 picture descriptions for Yucatec
  • 215 picture descriptions for Seri

- 240 descriptions were recorded for Seri, but only 216 have been transcribed and coded to date
  • and of these, one is disregarded here as apparently incorrect
- all descriptions locate the Ball and almost all in addition orient the Chair

• describing the location of the Ball
  - the conceptually simplest locative descriptions are
topological (Piaget & Inhelder 1956)
  - these are perspective-free, employing no FoR
  - 47% of Seri locative descriptions and 22% of Yucatec
tlocative descriptions contain topological predications

(2.1) (...) i-hiin hac, zix

SER 3 POSS-near DEF. ART. SG. LOC thing

c-oqueht quij i-ti m-iij.

SBj: NMLZ-bounce DEF. ART. SG. sit 3 POSS-on DP. sit

'(...) the ball (lit. thing that bounces) is near it [the chair].'

(2.2) (...) te'lu x k-u=kutal máak=o', te'lu x/m=o',

YUC DADV where IMPF-A3=sit-INCH.INC person=D2 PREP: DET=earth=D2

hun p'tel bóola pek ekxal hachtu tu'k'=o'.

one CL in ball lie as if dropped DIS(RISG) really PREP. A3=comer=02

'(...) there where one sits, on (lit. with respect to) the ground, a ball is lying, right at its corner.'

(2.3) (...) i-pac i-icp hac, i-toaa i-icp

SER 3 POSS-back 3 POSS-side DEF. ART. SG. LOC 3 POSS-foot 3 POSS-side

hac hi-ic c-aap cap
DEF. ART. SG. LOC 1 POSS-side SBj: NMLZ stand DEF. ART. SG. stand

ha zix c-oqueht quij i-ti y-iij.

FOC thing SBj: NMLZ-bounce DEF. ART. SG. sit 3 POSS-on DP. sit

'(...) the ball is behind it [the chair] and on the side of the leg that is on my side.'

(2.4) (...) tu=tseel=i', buéeno, tu=pac i-icp

YUC PREP: A3=side=D4 well PREP: A3=back

te'lu x k-u=nak-tal máak=o'.

DADV where IMPF-A3=lean-INCH DIS person=D2

'( ...) on its side, well, behind where one sits.'
- relative FoRs
  - these occur in 10% of Yucatec descriptions, but play only a negligible role in Seri

  (2.5) Ti’=pek-kun-a’n
  PREP=lie.as.if.dropped-CAUS-RES(B3SG)
hun-p’iel chan=bòola’i’ tu=t’ëed=ë’
  one-CL.IN DIM=ball=D4 PREP-A3=side=D3
  ‘There lies a little ball, on (the chair’s) side.’

- and then there is the new ‘head-anchored’ type
  accounting for 17% of Seri locative descriptions
  and 8% of Yucatec locative descriptions
  the descriptions may be ‘anchored’ to the speakers and/or addressee’s body
  - without the truth conditions of the description depending on the orientation of the speaker/addressee
    + unlike in a relative FoR

  (2.7) […] cmalal zix c-oqueht quij
  SER now thing SB1.NMLZ-bounce DEF.SG.ART.stand
  hant com
  1.POSS-side DEF.ART.SG.LOC FOC 3POSS-side
  ‘(…) and now the ball (lit. thing that bounces) is on my side.’

  (2.8) Te=pàarte t-bak=t’ëel-il-o’n
  YUC PREP=DET=part PREP=A1PL=straight-REL-B1PL thus how sit=EXFOC-B1PL
  bèeyhe’x kul=ik-o’n
  DEF.SG.ART.stand 3POSS-side RP-st
  ‘In the part in our direction the way we are sitting like this, there is a ball lying on the ground’

- describing the orientation of the Chair
  - the Yucatec speakers used cardinal direction terms
    and relative FoRs to orient the Chair
  - in 20% and 15% of descriptions, respectively

  (2.10) […] le=pàarte tu’x k=xíc=katal màak=o’
  YUC DET=part where IMPF-A3=lean.against-INCH.INC person=D2
  chik’in suiat-ul
  HESIT west turn=MIDDLE+INC(B3SG)
  ‘(...) the part where one sits, it’s turned west (…)’

  (2.11) […] le=sìila a’, estéen,
  YUC A3=head DET=chair=D2 HESIT
  x-m’o’ suiat-ul
  F-right(B3SG) 3POSS-side
  ‘(...) the backrest (lit. head) of the chair, it’s turned right’

  this shows that orientation descriptions, like locative descriptions, are interpreted in FoRs

- absolute FoRs
  - both languages employ absolute FoRs in the horizontal
    - Seri has terms based on directions of prevailing winds
    - Yucatec has terms based on the sunrise/sunset
  - 8% of Yucatec locative descriptions used cardinal terms
    - as compared to a mere 1% of Seri descriptions

  (2.6) Te’=pek-eelbal hun-p’iel chan=bòola’i’. PREP=lie.as.if.dropped-DIS(B3SG)
  YUC DADV west=D2 near(B3SG) PREP=earth=D2
  ‘There in the west, close by on the ground, there is lying a little ball.’

- or the description may be anchored to some "landmark" entity in the environment
  - without the orientation of that entity affecting the truth conditions of the description
    + unlike in absolute (e.g., upriver/downriver or uphill/downhill) FoRs

  (2.9) …zix c-oqueht quij hant com
  SER thing SB1.NMLZ-bounce DEF.ART.SG.stand land DEF.ART.SG.lead
  i-t’ëel t-iij ma, haco mos iglesia
  3POSS-on REAL.DEP-sit SR already again church
cop i-lcüp hac i-lcüp
  DEF.ART.SG.stand 3POSS-side DEF.ART.SG.LOC 3POSS-side
t-iij... REAL.DEP-sit
  ‘(...) the ball (lit. thing that bounces) is on the ground, again, it is on the side of the church…”

- but most orientation descriptions are parallel to the ‘head-anchored’ type of locative descriptions
  - 63% of Seri descriptions and 58% of Yucatec descriptions reference the speaker’s and/or addressee’s body
  - but without their truth conditions depending on the orientation of the speaker’s/addressee’s body, unlike in relative descriptions

  (2.12) Hehe i-t’ëelolomù quij
  SER word 3POSS-on OBL.NMLZ.ABS POSS.PST.PL DEF.ART.SG.stit
  hant com
  1.POSS-toward REAL.DEP-back SR
  ‘The chair (lit. wood one sits on) has its back to me (…)’

  (2.13) Tu’x k=xíc=katal màak=o’
  YUC where(B3SG) IMPF-A3=lean.against-INCH.INC person=D2
  èstée ta=freente suiat-ul
  HESIT PREP=A2=front turn=MIDDLE+INC(B3SG)
  ‘The back (lit. where one leans against), uh, it’s turned towards your front.’
Vectors and frames of reference

FoRs in Seri and Yucatec (cont.)

• 33% of Seri and 7% of Yucatec descriptions orient the chair vis-a-vis some external landmark
  - again without their truth conditions depending on the orientation of the landmark, unlike in absolute descriptions

(2.14) Hehe i-tî iquicollîm quîq
SER wood 3POSS-on OBL.NMLZ.ABS.POSS.sit.PL DEF.ART.SG.sit
Xpacionax i-iqlp hác i-iqlui
Puerto.Libertad 3POSS-side DEF.ART.SG.LOC 3POSS-toward
t-îlîc (...) REAL.DEP.face

‘The chair (lit. what one sits on) is facing Puerto Libertad (...)’

(2.15) (...) u=frèente tu’x k-u=kutal màak=o’,
YUC A3=front where IMPF-A3=sit:INCH.INC person=D2
tu=tòoh-il le=kàancha=o’
PREP:A3=straight-REL DET=court=D2

‘(...) its front where one sits, it’s in a straight line with respect to the volleyball court.’

• overall, 96% of orientation descriptions in Seri and 65% in Yucatec are “head-anchored”

FoRs in Seri and Yucatec (cont.)

• comparison: locative vs. orientation descriptions
  - the ‘head-anchored’ type dominates in orientation descriptions
  • but plays only a minor role in locative descriptions
  • intrinsic FoRs play a major role in locative descriptions, but none in orientation descriptions
  what’s going on here?

FoRs and vectors

• semantic primitives for the representation of orientation and direction of motion: vectors
  - contra Jackendoff 1983, who treats orientation in terms of metaphorical motion paths

• representing orientation
  - objects are oriented by aligning any unique semiaxis with a suitably determined vector
  • in English, Seri, and Yucatec, the default is the front semiaxis

(3.1) (The back/left of) the chair is facing me/the door

Orientation: any vector $\mathbf{v}$ defines the orientation of an object iff
(i) the tail of $\mathbf{v}$ is the center of the object,
(ii) $\mathbf{v}$ is collinear with one of the object’s semiaxes and pointing outward.
By default, $\mathbf{v}$ is collinear with the object’s front semiaxis.
Vectors and frames of reference

STALDAC 2010 J. Bohnemeyer & C. K. O’Meara

• two ways of defining vectors
  – in terms of an ordered pair of places (head and tail)
    (3.3) The chair is facing the door
  – in terms of an ordered pair of a place (tail) and an angle
    • between the vector and the axis of some coordinate system = FoR
    – by default, this angle is 0°
    (3.4) The chair is facing (35°) S(SE)/right

Figure 23. Chair, facing door

Figure 24. Chair, facing (35°) S(SE)/right

• FoRs and vectors (cont.)
  • FoRs in orientation descriptions
    – the axes of a relative or absolute FoR may be transferred onto the figure in order to orient it
      • the same way they would be transferred onto a ground entity in order to locate a figure with respect to it
    (3.5) The chair is facing (35°) S(SE)/right/downriver
    (3.6) The ball is (35°) S(SE)/right/downriver of the chair

Figure 25. Chair, facing downriver

Figure 26. Chair, facing door/observer

• FoRs in orientation descriptions (cont.)
  – how does one know that this type of description involves any FoR at all?
    • because such descriptions imply the logical power of FoRs!
    • any vector has the power to partition space into regions which may serve as the “quadrants” of a FoR
    • head-anchored locative descriptions precisely tap into this potential
  (3.7) a. The ball is towards the door/us from the chair
      b. The ball is away from the door/us with respect to the chair
  (3.8) a. The ball is our side/the door’s side of the chair
      b. The ball is on the other side of the door/us from the chair

Figure 27. Vector partitioning space in head-anchored locative descriptions

• a false alternative analysis
  – head-anchored orientation descriptions involve intrinsic FoRs
    • since they are logically equivalent to intrinsic locative descriptions
  (3.10) The chair is facing the door/us
      \Rightarrow We are/the door is/in front of the chair

Figure 28. Chair, facing door/observer

• a false alternative analysis (cont.)
  – we reject this analysis
    • as do Terrill & Burenhult 2008
      – though their argumentation is different from ours
• defeating the intrinsic analysis of head-anchored orientation descriptions – it is in fact possible to define direction vectors intrinsically – in motion descriptions!

(3.11) The chair started to move forward/backward/sideways
- clearly, such descriptions are intrinsic
  • as can be seen by contrasting them with relative/absolute ones

(3.12) The chair started to move left/north/upriver

Figure 29. Chair, moving forward/backward/sideways

- the computations involved in head-anchored orientation descriptions are of the same kind
• as those involved in head-anchored locative descriptions

(3.14) The chair is facing forward with respect to the door/us
(3.15) The ball is on our side/ the door's side of the chair
  • both types of descriptions involve an external anchor defining the head of a vector
  • but (3.15) cannot be intrinsic
  - it’s truth-conditions do not depend on the orientation of the chair!
  - we conclude that both types of descriptions involve the same type of FoR
  • the head-anchored type

Figure 31. Head-anchored FoRs in orientation and locative descriptions

FoRs reclassified
• head-anchored vs. angular-anchored FoRs
  - the axes of “Levinsonian” relative, absolute, and intrinsic FoRs are modeled after the anchor’s axes

(4.1) The chair is facing right/south/downriver
(4.2) The ball is in front of/right/south/downriver of the chair
  • consequently, the truth-conditions of descriptions in such FoRs depend on the orientation of the anchor
  - let us call these angular-anchored FoRs

Figure 32. Chair, facing downriver

- but intrinsic terms are not able to describe the orientation of an entity
  • orientation descriptions inescapably require an extrinsic viewpoint/perspective

(3.13) The chair is facing forward/backward/sideways with respect to us/the door
- such descriptions are intrinsic
  • since they involve an external anchor marking the head of the orientation vector
  • this is why there are no intrinsic orientation descriptions!

Figure 30. Orientation description require an external anchor

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Figure 33. Chair, facing door/observer

• in contrast, the axes of head-anchored FoRs are vectors defined by determination of their heads
(4.3) The chair is facing the door/us
(4.4) The ball is towards the door/us from the chair
  • even though the vectors directly define only single semi-axes, logically every such vector entails an entire FoR

Figure 33. Chair, facing door/observer

Figure 34. A single vector – a place and an angle – defining an entire FoR

• this explains why the truth-conditions of head-anchored descriptions depend, not on the orientation of the anchor
  - but on the location of the anchor
Vectors and frames of reference

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Summary

- location and orientation are orthogonal spatial properties of entities
- both appear to be universally represented in language
- both may depend on spatial frames of reference (FoRs) for their interpretation
- orientation appears to be cognitively represented in terms of vectors
  - rather than in terms of metaphorical motion paths
- the semiaxes of FoRs and objects may be cognitively encoded as vectors

References


References (Cont.)


