Interactive alignment and routinization as mechanisms for language change

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Overview

• Language change and transmission
• Dialogue as interactive alignment
• Two automatic mechanisms of alignment
• Short-term co-activation of linguistic structure
• Long-term routinization
• Routinization as a mechanism of change
Evolution requires transmission

- Biological evolution depends on genetic transmission

- Language change depends on interpersonal structural and lexical transmission
  - Transmission via initial acquisition? (Lightfoot, 1991)
    - Too sparse for normal rate of language change at a lexical level (Barr, 2004)
  - Automatic transmission during usage?
    - Interactional alignment during dialogue
Information *alignment* rather than information *transfer*
Investigating alignment of representations in dialogue

Maze Game

key: * = finish position, X = player's position, S = switch box
= gate.
Description Schemes(1)

- **Figural**
  - Situation model: Figure Segmentation
  - Terminology: “right indicator” “L shape”
  - Example: “See the middle right indicator. I’m on the end of it”
Description schemes (2)

• Path
  – Situation model: Path Network
  – Example: “bottom right, along two, up one”
Description Schemes (3)

• Line
  – Situation model: // Lines or Levels
  – Example: “Third row two along”
Description scheme (4)

• Matrix
  – Situation model: Co-ordinate System
  – Terminology: “A, 3”, “Row 2, Column 3”
  – Example: “I’m row two, column three”.

![Matrix diagram]
Original Findings

• Garrod & Anderson (1987)
  – Pairs of individuals align on unambiguous description schemes
  – The schemes develop over a period of time to fit the pairs’ needs
  – Alignment is not controlled by explicit negotiation but rather by output/input co-ordination + interactive repair

Output-Input Coordination

• Match the most recent utterance from your partner with respect to:
  
  – lexical choice (G&A,’87)
  – lexical meaning(G&A,87; Brennan & Clark, ‘96)
  – conceptual model(G&A,’87)
Group alignment
(Garrod & Doherty, 1994)

• Isolated Pairs
  – 5 pairs play nine games each
• Virtual Community Group
  – 10 players play each of the other 9
• Non-Community Group
  – 5 lead players play 5 games with different partners with no common history of prior interaction

Choice of Schemes by Group

% choice

Game1  Game2  Game3  Game4  Game5

Matrix1  Matrix2  Matrix3  Line  Path  Figural
Development of group alignment
Evidence of automatic alignment at many levels in dialogue

- **Phonological-articulatory alignment** (Krauss & Pardoe, in press; Bard et al. 2000)
- **Lexical alignment** (Garrod & Anderson, 1987; Brennan & Clark: 1994)
- **Syntactic alignment** (Branigan et al. 2000)
- **Semantic/conceptual alignment** (Garrod & Anderson, 1987; Markman & Makin, 1998)
- **Alignment of reference frames** (Schober, 1993; Watson et al. 2004)
- **Alignment of situation models** (Garrod & Anderson, 1987; Garrod & Doherty, 1994)
The interactive alignment model

• Assumes
  – Successful dialogue leads to aligned representations at many levels
  – “Priming” across interlocutors supports direct (automatic) alignment channels at these levels
  – Percolation between levels means that alignment at one level enhances alignment at others
  – Straightforward alignment repair mechanism

• Contrasts with the autonomous transmission model for monologue

Pickering & Garrod, Behavioral & Brain Sciences (2004)
Interactive Alignment Model

Automatic alignment channels

A

Message

Situation Model

Semantic representation

Syntactic representation

Lexical representation

Phonological representation

Phonetic representation

B

Message

Situation Model

Semantic representation

Syntactic representation

Lexical representation

Phonological representation

Phonetic representation
Parity & Priming: +ve feedback system for alignment

Two automatic mechanisms of alignment?

• Short-term local alignment due to transient co-activation of linguistic structure
  – A: “What does Tricia enjoy(like) most?
  – B: ENJOY/LIKE “Being called your highness”
  – B: LIKE “To be called your highness” (Morgan, 1973)

• Long-term memory-based alignment or routinization
Short-lived syntactic alignment

• Depends on “priming” from comprehension to production and vice versa

• Evidence for syntagmatic syntactic priming from comprehension to production
Experiment to detect influences of comprehension on production

- **Bought**
- **Mary wanted to...**
- "Articulate written target word"
Syntactic priming experiment

Example prime fragments:

(1) Mary wanted to……
(2) She knew that she …. 

Target words:

(a) buy  (b) bought

syntactic consistency (Verb tense agreement)

1+ a, 2 + b - syntactically agrees
1 + b, 2 + a - syntactically “disagrees”
Production onset latency

**Comprehension-production priming**

- Priming effect (plausible) = 37 msecs
  - $F(1,23) = 25.5, p<0.01$
Automatic alignment mechanisms

• Short-term priming
  – As illustrated

• Long-term priming
  – Routinization process
Alignment & Routinization

• Routines in general
  – language fragments with high mutual information content (Charniak, 1993), e.g., idioms, stock phrases

• Why routines? - (Kuiper, ‘96)
  – Short-circuits levels of representation in production
Example of routinization

1----B: O.K. Stan, let’s talk about this. Whereabouts –whereabouts are you?
2----A: Right: er: I’m: I’m extreme right.
3----B: Extreme right?

........
8----A: You know the extreme right, there’s one box.
9----B: Yeah right, the extreme right it’s sticking out like a sore thumb.
10----A: That’s where I am.
11----B: It’s like a right indicator.
12----A: Yes, and where are you?
13----B: Well I’m er: that right indicator you’ve got.
short-circuiting production

Message

Situation Model

Semantic representation

Syntactic representation

Lexical representation

Phonological representation

Phonetic representation

“Right indicator”

“I’m just to the left of the right indicator”
Routinization

- Dialogue enables routines to be set up ‘on the fly’
- Dialogue is extremely repetitive
  - 70% words in London-Lund conversation corpus occur as part of recurrent combinations
- Dialogue Routines
  - ‘dialogue lexicon’ as a set of lexical routines
  - aligned syntactic, lexical, semantic fragments as routines (e.g., description schemes in G&A, ‘87, G&D ’94)
  - idiosyncratic to the dialogue participants
Defining Routines

- Routines are stored representations.
- Jackendoff (2002): Any linguistic information that is not computed on-line is stored as a lexical representation.
- Routines are therefore lexicalisations in Jackendoff’s (2002) terms.
Jackendoff’s lexical representations

• Simple lexicalisations - traditional lexical items
  – Mappings between *phonological*, *syntactic*, *conceptual/semantic* representations

• Complex lexicalisations - idioms, stock phrases etc.
  – Partial mappings between *phonological*, *syntactic*, *conceptual/semantic* representations
Simple Lexical Representations

“right” “indicator”

1. Word_i [Adj]_i [property TYPE: LOC, on the right]_i
   r y t

2. Word_j [N, sing, count]_j [object TYPE: Pointer]_j
   i n d i k e t t o r
Complex lexical representation

*John took Mary to task*

*In Jack (2002) *take to task* is a complex lexicalisation*
Complex Lexical Representations
“take to task”
Dialogue routines

• Non-productive routines - self-contained like non-productive idioms e.g., kick the bucket

• Semi-productive routines - like semi-productive idioms (constructions) e.g., Drink/Dance/Sing your way through the evening
Non-productive routine
“right indicator”
Semi-productive routine

Line Scheme (Garrod & Anderson, 87)

*I’m on the first floor, ..third floor, ..fifth floor etc.*

“Nth floor” routine
Semi-productive routine(1)

“Nth floor”
Semi-productive routine 2

Line Scheme (2)

I’m second bottom row

I’m third left

Nth top/bottom/left/right routine
Semi-productive routine(2)
“Second top row”
Evidence for long-term alignment & routinization

- Communal lexicons (Clark, ‘98)

- Community alignment vs. non-community misalignment in maze game dialogues
Group alignment
(Garrod & Doherty, 1994)

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Choice of Schemes by Group

% choice
Evidence for long-term routinization

% Align.

Game

Community
Non-community
Community versus Non-community effects

• Community convergence -
  – Systematic routinization across the community

• Non-community divergence -
  – Local alignment clashes with unsystematic (unshared) long-term routinization across non-community
Summary & Conclusion

• Two automatic mechanisms of interactive alignment
  – Short-term co-activation of aligned structures
  – Long-term establishment of aligned memory representations or routines

• Routinization
  – Mechanism for driving language change in communities
  – Simulation of automatic community convergence using a similar mechanism (Barr, 2004)
The End

Thank you
The End -- Thank you