Linguistic Coordination Report

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Communication Accommodation Theory

Participants in conversations tend to converge to one another's communicative behavior: they coordinate in a variety of dimensions including choice of words, syntax, utterance length, pitch and gestures.[2]

Dimension	Canonical study
Posture	Condon and Ogston, 1967
Pause length	Jaffe and Feldstein, 1970
Utterance length	Matarazzo and Wiens, 1973
Self-disclosure	Derlenga et al., 1973
Head nodding	Hale and Burgoon, 1984
Backchannels	White, 1989
Linguistic style	Niederhoffer and Pennebaker, 2002

Examples of dimensions for which accommodation was observed and the respective studies

LIWC

- LIWC is a text analysis program with a group of built-in LIWC dictionary, which is composed of 5,690 words and word stems. Each word or word stem defines one or more word categories

- It reads a given text and counts the percentage of words that reflect different emotions, thinking styles, social concerns, and parts of speech.

- LIWC is the basis of all recent work on linguistic style accommodation

- We say that an utterance exhibits a given stylistic dimension if it contains at least one word from the respective LIWC vocabulary.

Measuring Linguistic Style : LIWC (Linguistic Inquiry Word Count) Method

Why?

- A study by a psychologist George Miller has shown that style and topic are processed differently in the brain.

- Distinction between the two is important in investigation of linguistic style accommodation.

- In order to measure style and avoid confusion with topic the measurement, we will follow a psycholinguistic methodology used in a variety of applications, known as the LIWC method.

LIWC Dimensions and Sample Words

DIMENSION	EXAMPLES
I. STANDARD LINGUISTIC DIMENSIONS	
Pronouns	I, them, itself
Articles	a, an, the
Past tense	walked, were, had
Present tense	Is, does, hear
Future tense	will, gonna
Prepositions	with, above
Negations	no, never, not
Numbers	one, thirty, million
Swear words	*****
II. PSYCHOLOGICAL PROCESSES	
Social Processes	talk, us, friend
Friends	pal, buddy, coworker
Family	mom, brother, cousin
Humans	boy, woman, group
Affective Processes	happy, ugly, bitter
Positive Emotions	happy, pretty, good
Negative Emotions	hate, worthless, enemy
Anxiety	nervous, afraid, tense
Sadness	grief, cry, sad
Cognitive Processes	cause, know, ought
Insight	think, know, consider
Causation	because, effect, hence
Discrepancy	should, would, could
Tentative	maybe, perhaps, guess
Certainty	always, never
Inhibition	block, constrain
Inclusive	with, and, include
Exclusive	but, except, without
Perceptual Processes	see, touch, listen
Seeing	view, saw, look
Hearing	heard, listen, sound
Feeling	touch, hold, felt
Biological Processes	eat, blood, pain
Body	ache, heart, cough
Sexuality	horny, love, incest
Relativity	area, bend, exit, stop
Motion	walk, move, go
Space	Down, in, thin
Time	hour, day, oclock

Linguistic Style Markers

Dimension	Examples
Article	a, an, the
Conjunction	but, whereas, nor
Auxiliary Verb	mustn’t, having, becomes
Adverb	constantly, so, often
Personal Pronoun	I’m, you, ourselves
Indefinite Pronoun	what’s, these, it
Preposition	above, beneath, as
Quantifier	equal, much, both

Why function word classes?

By focusing on function word classes, rather than domain-specific substantive content, we are able to evaluate the domain-independence of our techniques and their ability to generalize across different contexts

• *First example:* The following exchange from the movie "The Getaway" (1972) demonstrates quantifier coordination.

Doc: At least you were outside.
Carol: It doesn't make much difference where you are [...]

Carol: It doesn't really matter where you are

Quantifier coordination

Example:

Client: "At what time does your shop close?"

Client: "What time does your shop close?"

Shopkeeper: "At five o'clock."

Shopkeeper: "Five o'clock"

Level and Kelter(1982) report

Preposition coordination

Power differences from Linguistic coordination

- People with low power exhibit greater language coordination than people with high power

- Conversely, people coordinate more with interlocutors who have higher power than with those who have lower power.

- When a person undergoes a change in status, their coordination behavior changes, and so does the coordination behavior of people talking to them

- When an individual is trying to convince someone who holds an opposing view, this creates a form of dependence and hence a power deficit in the sense of exchange theory

Coordination Measures

Unit of interaction : Conversational turn

m: Linguistic marker

b : Speaker (person replying to the target)

a : Target (person who initiated a conversation turn)

(a : u1, b : u2) : corresponding utterances

$\mathbf{E^{m}_{u1}}$: event that utterance u1 (spoken to b) exhibits m

$\mathbf{E^{m}_{u1\ ->\ u2}}$: event that reply u2 to u1 exhibits m

$$\mathbf{C^{m}(b, a) = P(E^{m}_{u2\ ->\ u1}\ |\ E^{m}_{u1})\ -\ P(E^{m}_{u2\ ->\ u1})}$$

Measuring how much a's use of m in utterance u1 increases the probability that b will use m in his reply u2, where the increase is relative to b's normal usage of m in conversations with a.

Ex)

m : auxverb

b (speaker) : Patient

a (target) : Doctor

Target D : Hello, how **are** you? **(u1)**

Liwc-categories : {adverb, auxverb, ppron, conjunction}

Speaker P : I'm good, how **are** you? **(u2)**

Liwc-categories : {adverb, auxverb, ppron, conjunction}

$$\mathbf{C^{auxverb}(P, D) = P(E^{auxverb}_{u2\ ->\ u1}\ |\ E^{auxverb}_{u1})\ -\ P(E^{auxverb}_{u2\ ->\ u1})}$$

Aggregated Measures

- Aggregated 1 : average scores only over users with a score for each coordination **marker**.

- Aggregated 2 : fill in missing scores for a user by using the group score for each missing **marker**. (assumes different people in a group coordinate the same way.)

- Aggregated 3 (Default) : fill in missing scores for a user by using the average score over the **marker**s we can compute coordination for for that user. (assumes a user coordinates the same way across different coordination markers.)

coord.score(corpus, speaker, target)

Function that calculates the coordination score of a speaker towards the target (corpus level) :

- Takes in three parameters: corpus, speaker, target
- Creates a list of all utterances of reply_tos of a speaker to the target (u2) and a list of utterances of the target (u1) that the speaker was replying to
- It loops through the created list of utterances of reply_tos of the speaker to the target (u2) and does a **probability computation** whether the speaker's reply_to (u2) exhibits the linguistic marker of the target's utterances that the speaker was replying to (u1).

$$C^m(b, a) = P(E^m_{u2 \text{ -> } u1} \mid E^m_{u1}) \; - \; P(E^m_{u2 \text{ -> } u1})$$

Probability Computation (in depth):

1. Four dictionaries are created, where keys are linguistic markers: Tally, Conditional Tally, Conditional Total, and n_utterances(stores the count of reply_tos of the speaker to the target)
2. It loops through all the reply_tos (u2s) of the speaker to the target and adds 1 to n_utterances
    1. Then, it loops through the linguistic markers in (u2) and the linguistic markers in (u1)
        1. It adds 1 to the Tally dictionary for the linguistic marker in (u2)
        2. It adds 1 to the Conditional Total dictionary of the linguistic marker in (u1)
            1. It also adds 1 to the Conditional Tally dictionary if (u2) also has the linguistic marker
3. Then it creates a dictionary for all 8 linguistic markers(article, conj..etc) and loops through each marker
    1. For each linguistic marker, it updates its value with its corresponding Tally, Conditional Total, Conditional Tally dictionary values as follows :
        1. (Conditional Tally / Conditional Total) - (Tally / n_utterances)

$$P(E^m_{u2 \text{ -> } u1} \mid E^m_{u1}) \quad - \quad P(E^m_{u2 \text{ -> } u1})$$

4. Returns the average score from each marker = sum of all scores from each marker / length of the dictionary (aggregate 3)

coord.score_report(corpus, score)

- Returns a dictionary of a where key = marker, and value = calculated score, rather than the average score for all the markers as the coord.score function returns

ex)

```
{'adverb': 0.1580821917808219,
 'article': -0.17737364194615024,
 'auxverb': 0.004085556356645037,
 'conj': 0.07534246575342468,
 'ipron': 0.04623287671232878 5,
 'ppron': -0.07718651211801897,
 'preps': -0.06265854895991885,
 'quant': -0.1373124592302 6744},
```