

How do we know we both know?

Measuring Mutual Understanding



1. Early work

Interaction chronograph, metacommunication

2. Experimental semiotics

Sign language, talking heads, Pictionary

3. Mutual understanding

Tacit communication game

Interaction chronograph



QUANTITATIVE ANALYSIS OF THE INTERACTION OF INDIVIDUALS

By ELIOT D. CHAPPLE

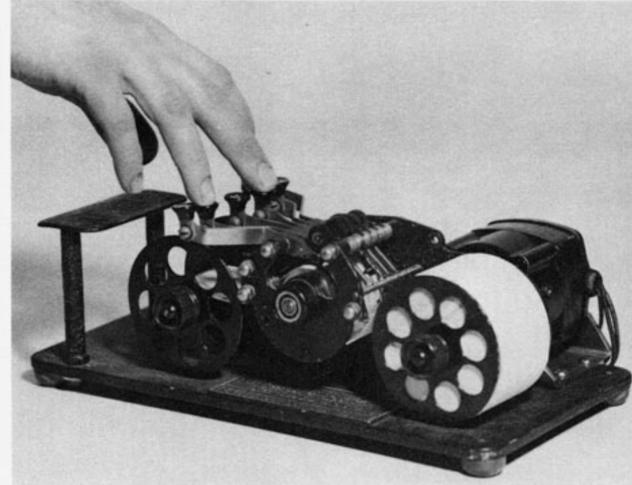


FIGURE 1a

INTERACTION CHRONOGRAPH USED IN THE SQUANTUM INVESTIGATION

(An improved model which greatly reduces the task of scoring was used in the Williams College study, reported in Part II of this report.)

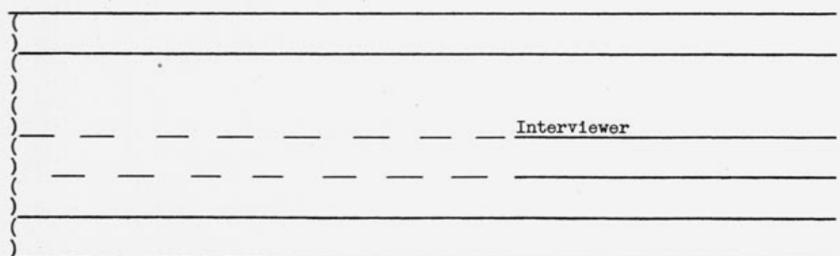


FIGURE 1b

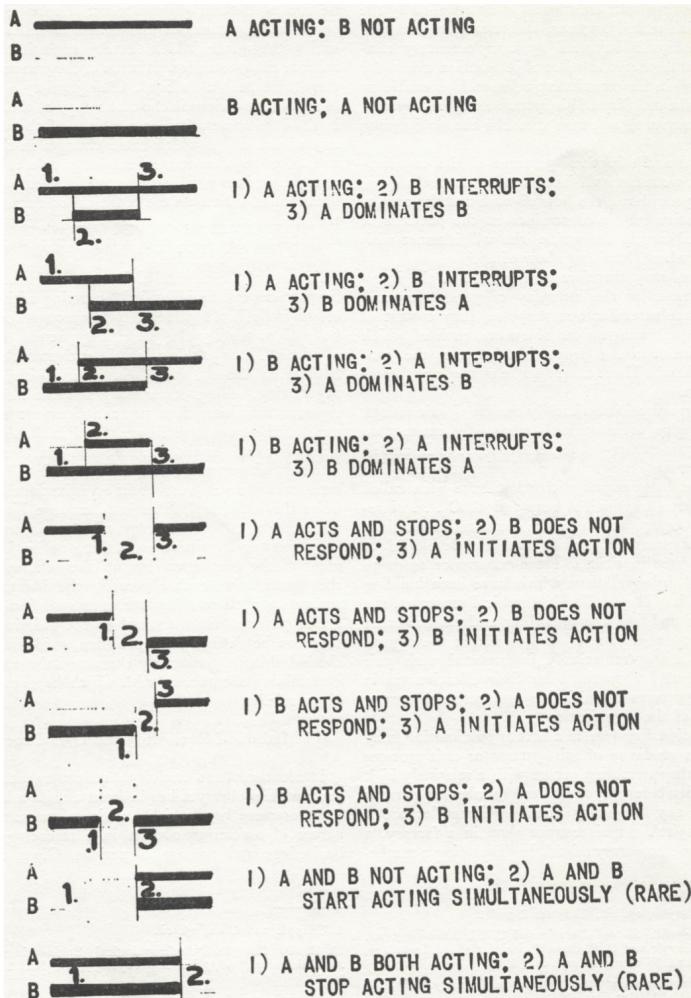
SAMPLE RECORD FROM INTERACTION CHRONOGRAPH

(The record is read from right to left. Breaks in a line represent periods of action.)

Measuring human interaction (Chapple, 1939)

Interaction chronograph

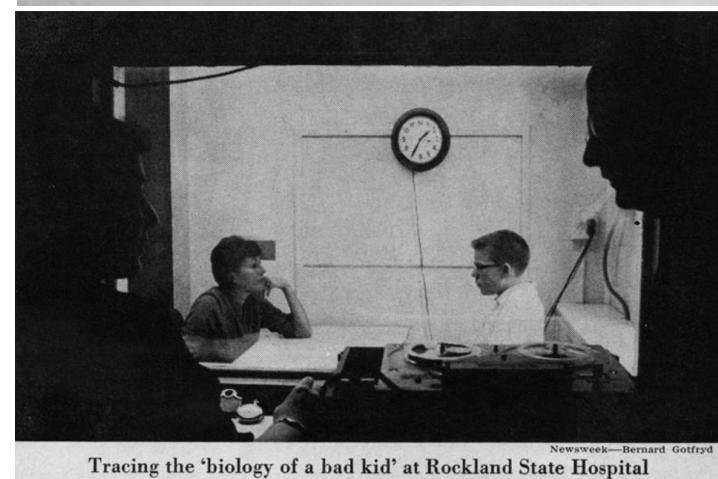
THE TWELVE POSSIBLE INTERACTION SEQUENCES
IN PAIR RELATIONS



Your Personality Sits for its Photo

By GERARD PIEL

By studying this graph an employer can tell the job for which an employee is best fitted



Quantifying personality and temperament characteristics

Interaction chronograph

It is the aim of the authors to contribute to a science of human interaction which is "precise, abstract, and quantitative," and indeed they have succeeded, although the reader is sometimes left with the feeling that they have been too abstract and too quantitative. They seem to present only the barest bones of interaction, by mathematical operations which are at times so far removed from a concrete referent (even to the referent of their own measurements) that the reader is forced to build many of his interpretations out of his own operationally unanalyzed experience. This may be simply a matter of incomplete presentation--the subject could be expanded much beyond the limits of a 147 page monograph. Or it may be due to the difficulty one has in divorcing his diffuse experiential knowledge of human interaction from his approach to a new and highly abstract treatment of interaction. At any rate, wherever responsibility lies, one is left with the impression that precise communication is still an unsolved problem for the social scientist who would be operationally exact.

Ruth Gallagher Goodenough
Cornell University

Metacommunication

- Messages have meanings at multiple contrasting levels of abstraction (e.g., monkey play)
- When someone sends a message, they must also send information about what constitutes the boundaries of the message's interpretation
- However, what is a “message” and “metamessage” cannot be identified in absolute sense
- There was no message, but only metamessages qualifying one another (Haley, 1976)

Communicating about what is being communicated (Bateson, 1951)

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Research criteria

- Respect collaborative and open-ended nature of human interaction (cf. a conversation)
- Experimental control over communicative environment (log interactive behaviors)
- Experimental control over communicative history (capture emergence of shared representations)

Communication in context

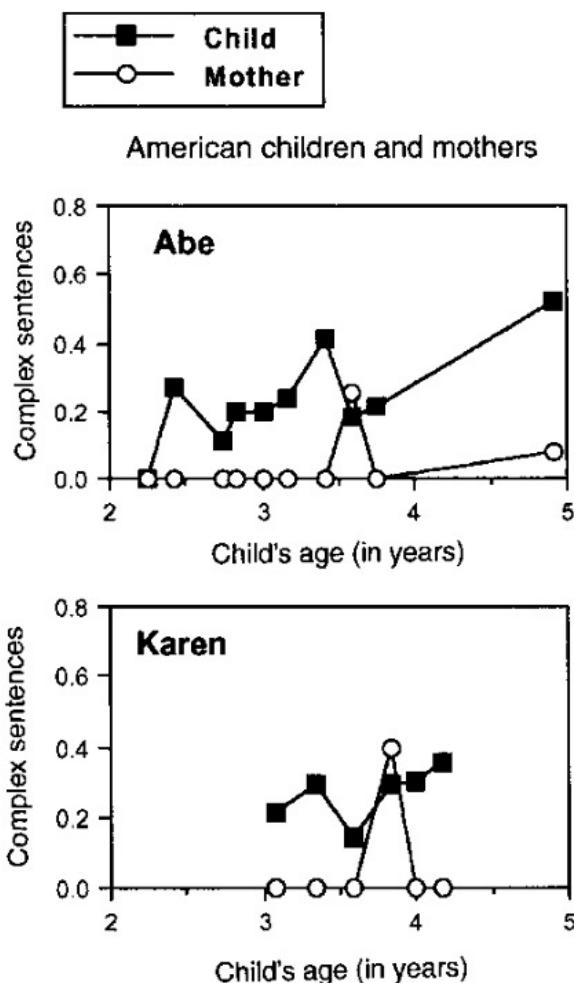
- **Psycholinguists:** Encoding and decoding of linguistic material by individual agents
(isolated from the context of interaction)
- **Generative linguists:** Internal structural dependencies of language
(focus on pre-defined rules instead of human agents)
- **Neuroscientists:** Passive observation or production of scripted behaviors
(knowledge retrieval rather than creation of mutual understanding)
- **Exp. semioticians:** Language use as joint action
(taking interactive contexts and generative elements seriously, interested in communication beyond purely linguistic means)

Nicaraguan sign language

Nicaraguan Sign Language
Emergence and Evolution

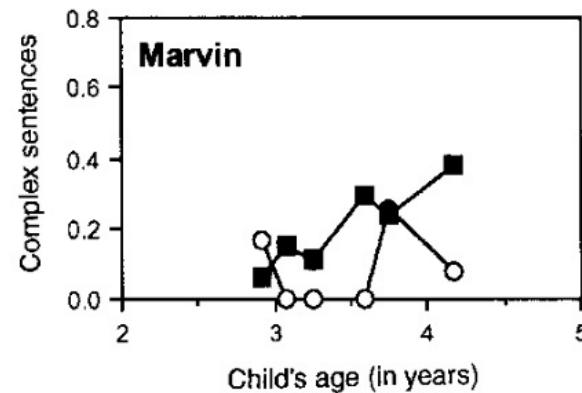
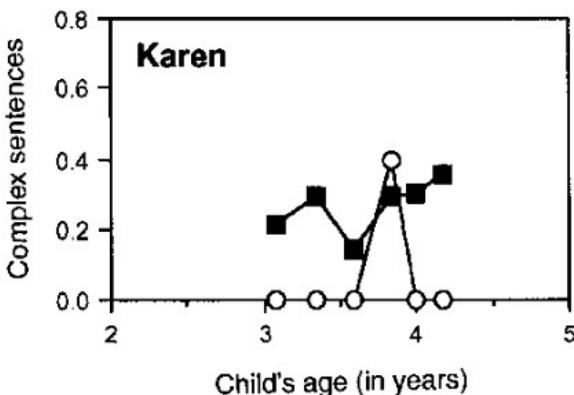
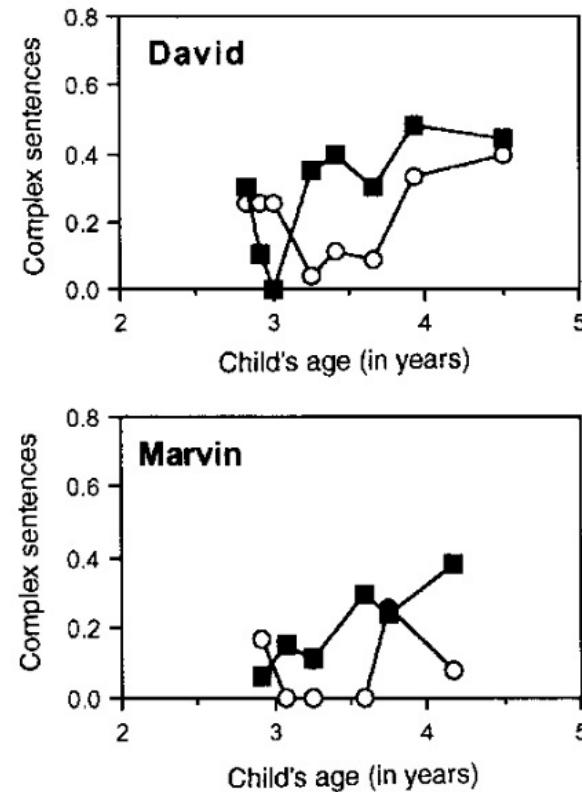


Home sign language



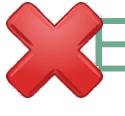
**Spontaneous sign systems
created by
deaf children in two cultures**

Susan Goldin-Meadow & Carolyn Mylander



Deaf children spontaneously introduce language-like structure into gestures

Research criteria

-  Respect collaborative and open-ended nature of human interaction (cf. a conversation)
-  Experimental control over communicative environment (log interactive behaviors)
-  Experimental control over communicative history (capture emergence of shared representations)



Talking heads



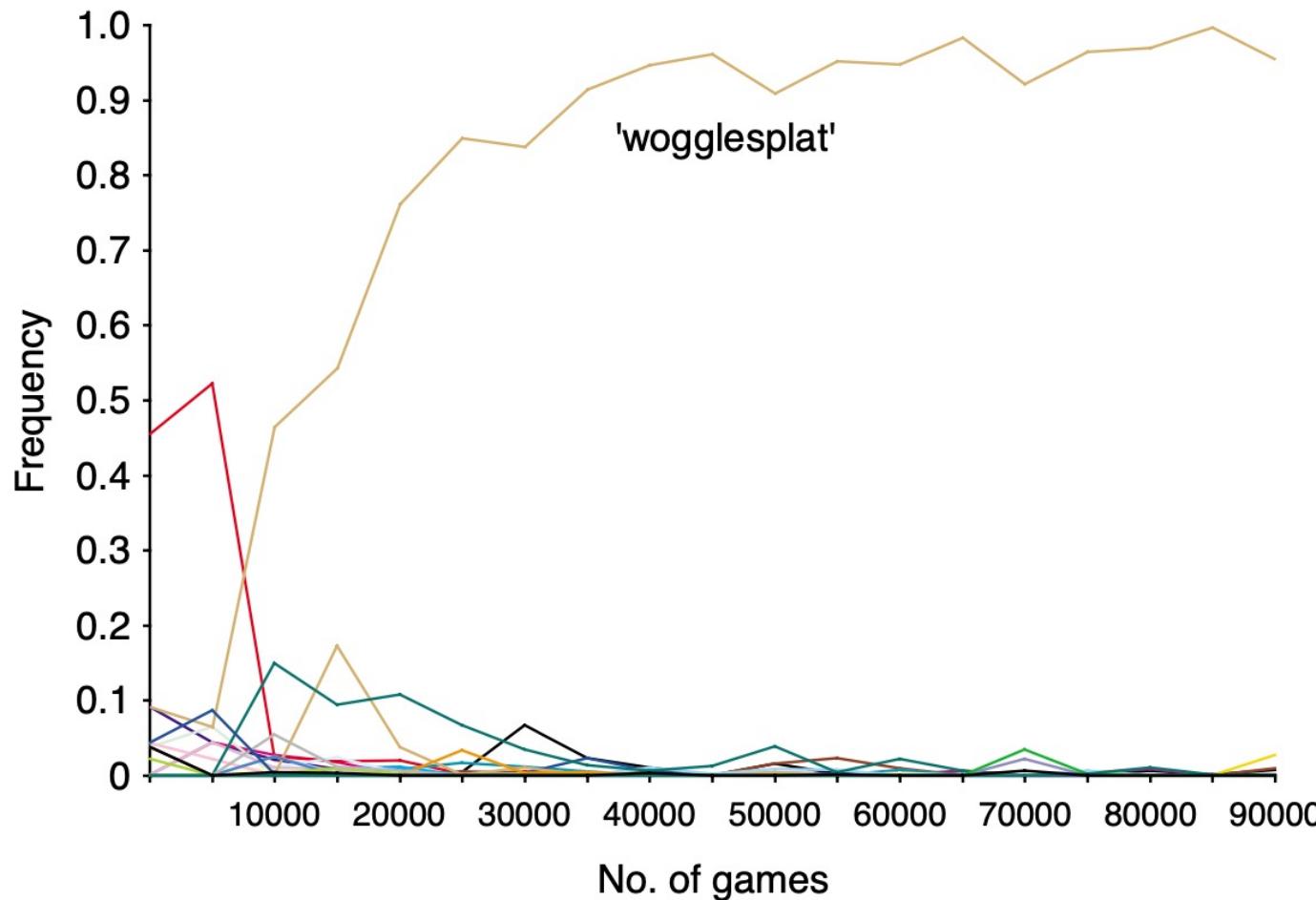
**Evolving grounded communication
for robots**

Luc Steels

Computer simulations



Talking heads



Establishing arbitrary mappings requires many thousands of interactions

Research criteria

-  Respect collaborative and open-ended nature of human interaction (cf. a conversation)
Prespecified word and figure options
-  Experimental control over communicative environment (log interactive behaviors)
-  Experimental control over communicative history (capture emergence of shared representations)
But not quite like how humans converge on a meaning



Pictionary task

Block 1 (CF)	Block 2 (CF)	Block 3 (CF)
Block 4 (CF)	Block 5 (CF)	Block 6 (CF)

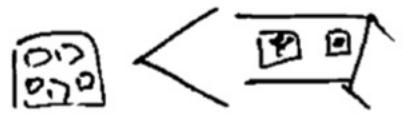
Foundations of Representation: Where Might Graphical
Symbol Systems Come From?

Simon Garrod^a, Nicolas Fay^{b,c}, John Lee^d, Jon Oberlander^d, Tracy MacLeod^a

Capturing the creation of conceptual pacts



Pictionary task

		
Block 1	Block 2	Block 3
		
Block 4	Block 5	Block 6

Increasing simplicity without reduction in semantic complexity

Research criteria

-  Respect collaborative and open-ended nature of human interaction (cf. a conversation)
Prespecified and limited set of referents
-  Experimental control over communicative environment (log interactive behaviors)
-  Experimental control over communicative history (capture emergence of shared representations)
Depictions rely on conventions and iconicity at first

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2. Experimental semiotics

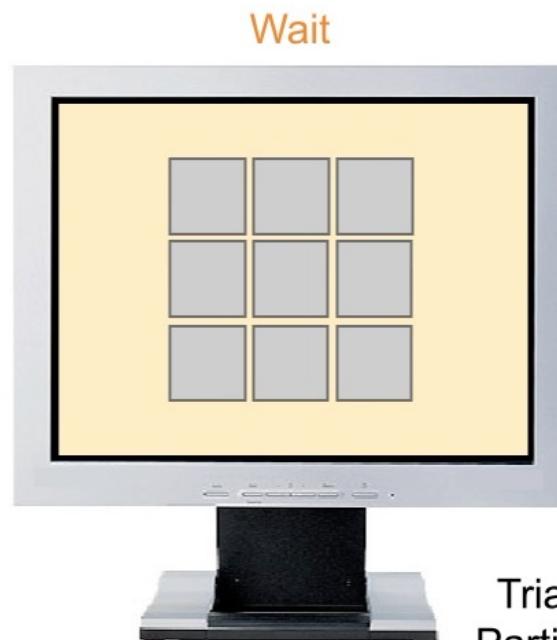
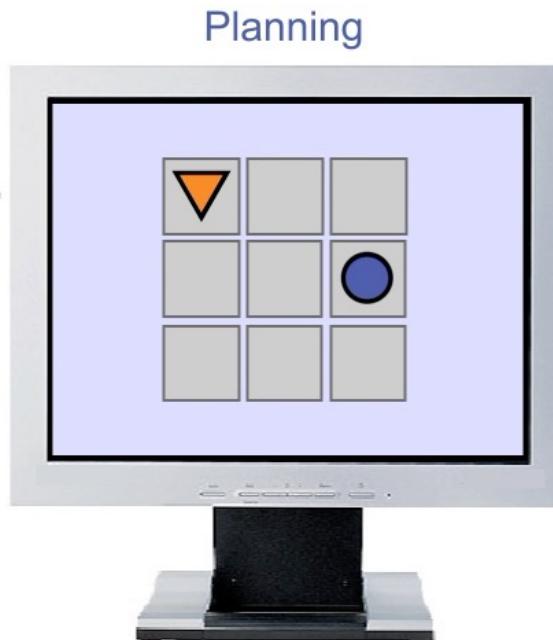
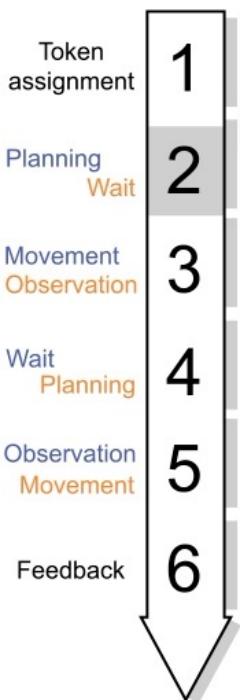
Sign language, talking heads, Pictionary

3. Mutual understanding

Tacit communication game



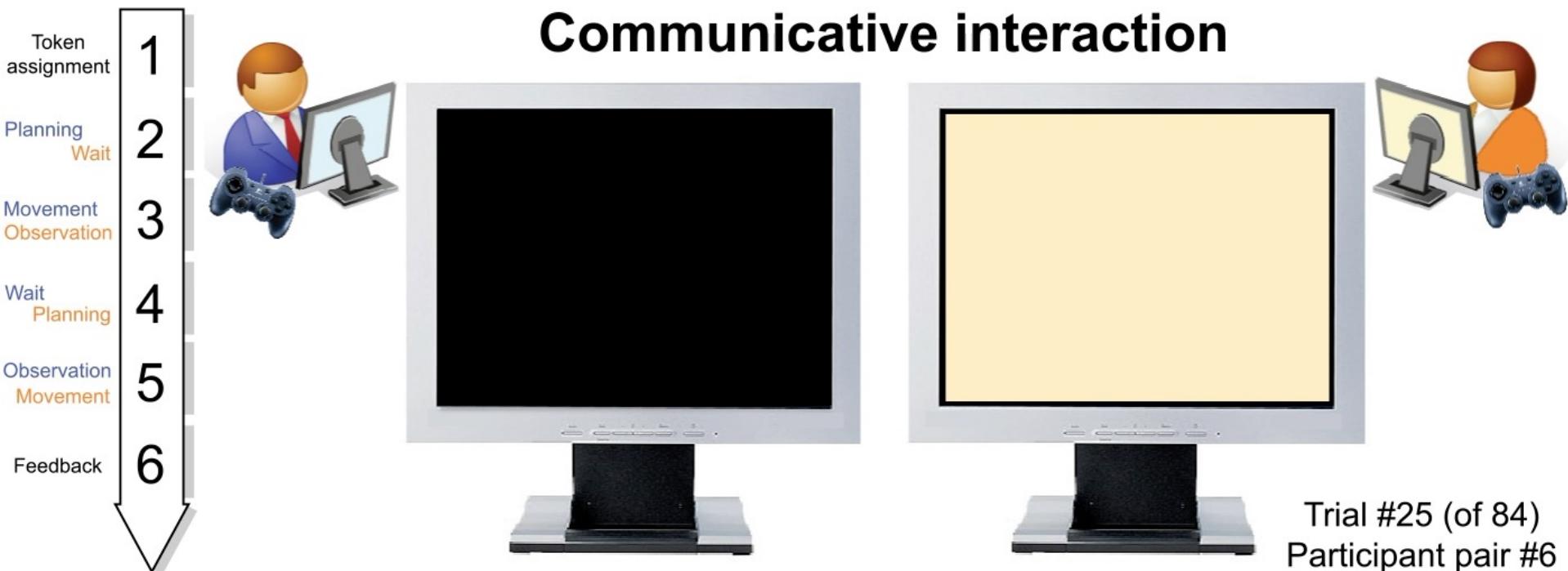
Tacit communication game



Trial #25 (of 84)
Participant pair #8

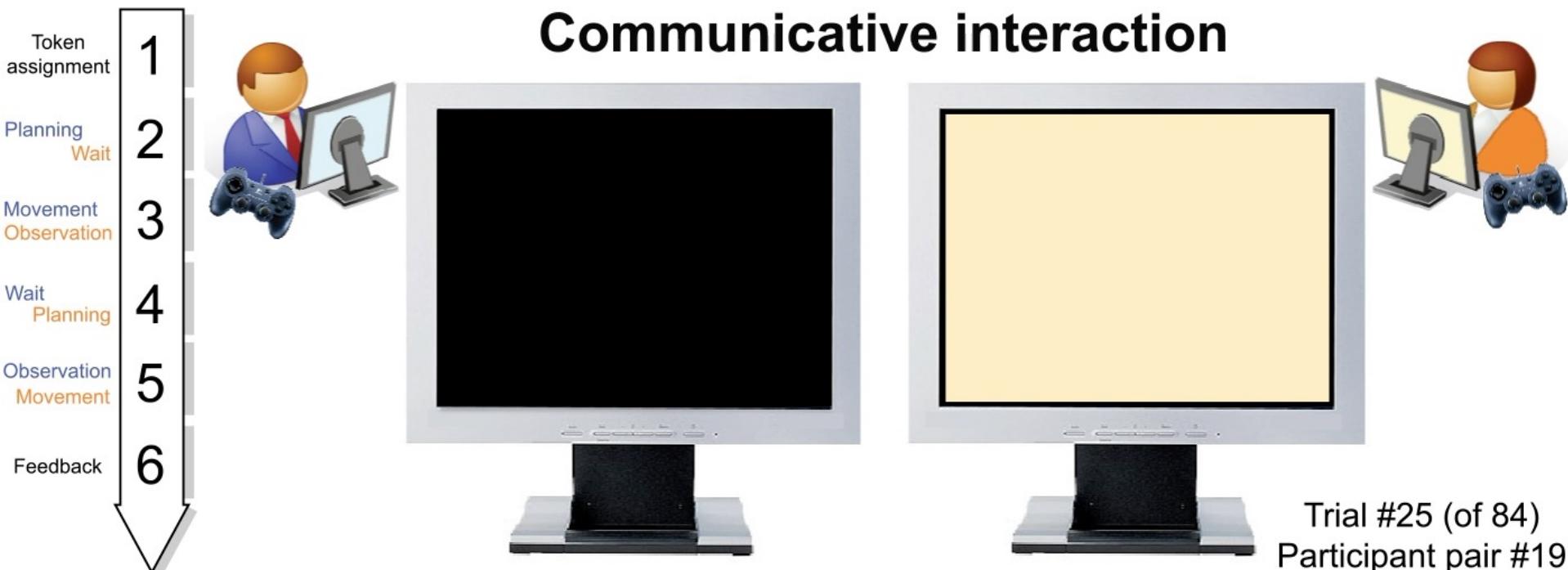
The Communicator (blue player) must use his own assigned shape to “tell” the Addressee (orange player) her shape’s target location and orientation

Tacit communication game

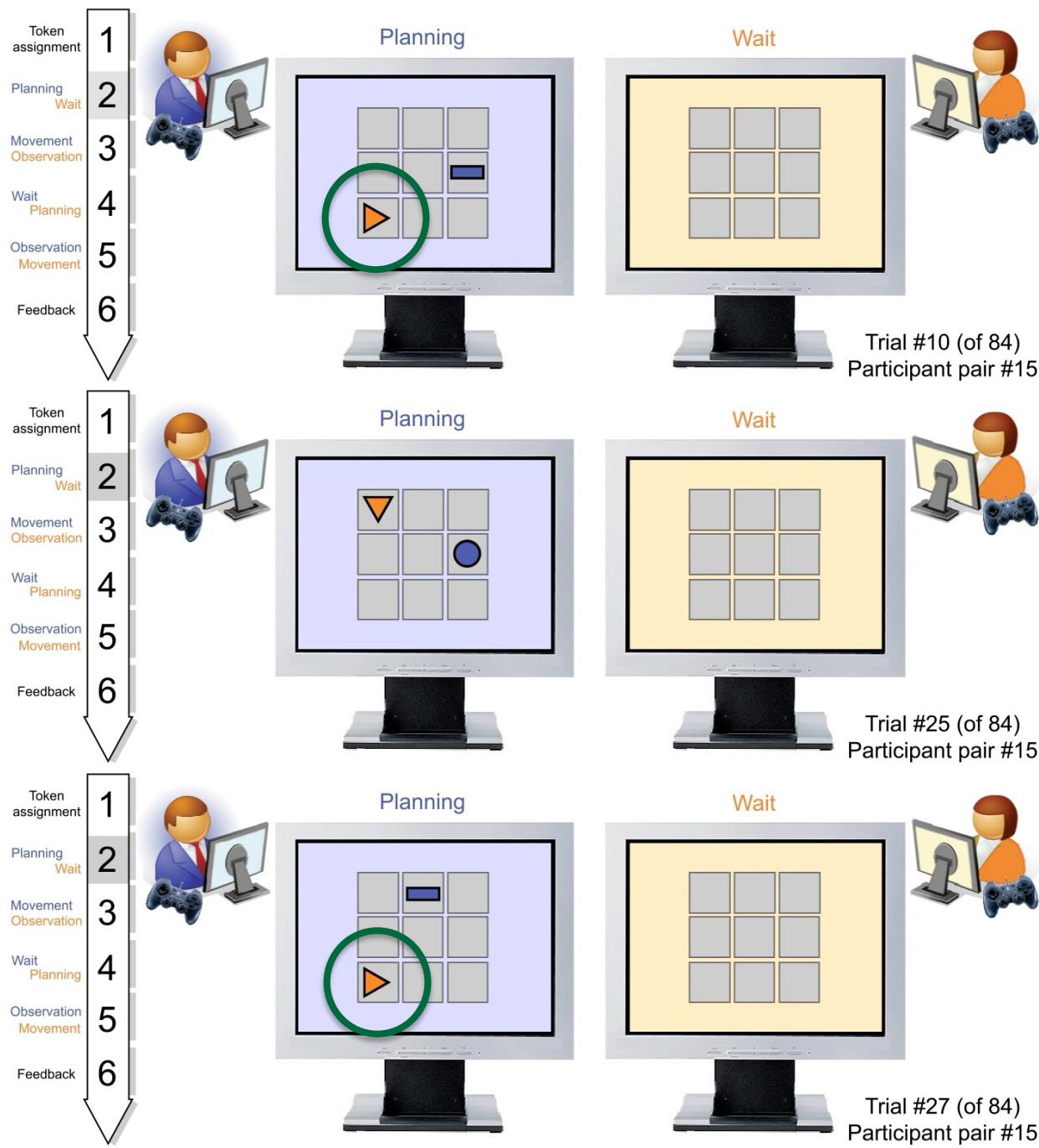


What is this Communicator “telling” you using his blue shape?

Tacit communication game



And what is this Communicator “telling” you?



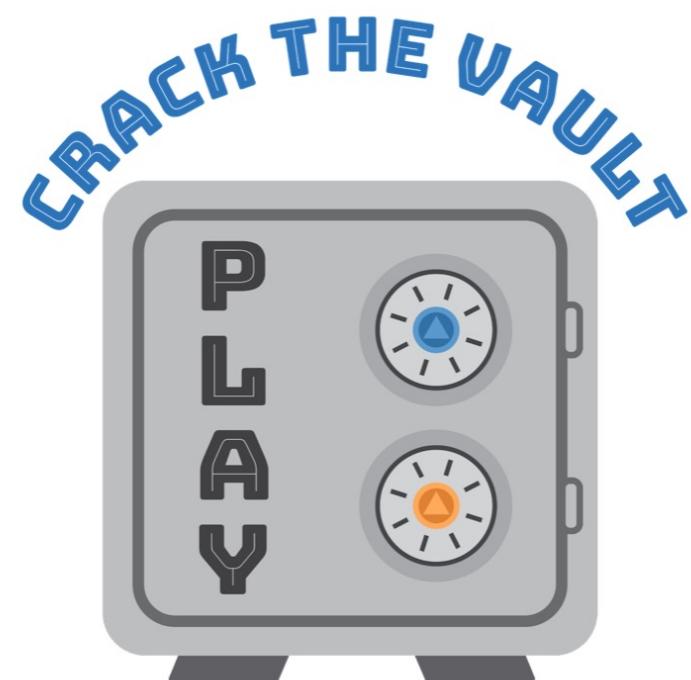
Research criteria

- ✓ Respect collaborative and open-ended nature of human interaction (cf. a conversation)
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- People are endowed with a special interactional intelligence that allows them to communicate successfully even without any conventions
- Experimental semiotics strips everyday communication of conventions to gain reliable access to this core interactional intelligence

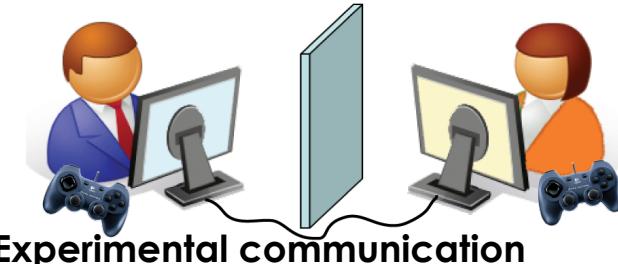
- Lab 3: Tacit communication game
- Play the Game at
www.MutualUnderstanding.nl
- Bring your laptop





Bonus: Natural vs. experimental dialogue

DARTMOUTH



What's different?

Multiple communication channels
(vocalizations, bodily and facial postures/movements, eye contact)

Single communication channel
(movements of a geometric shape:
experimental control over communicative environment)

Access to pre-existing conventions
(a common language, body emblems, facial expressions)

Novel communicative signals
(lack of pre-existing shared representations:
experimental control over shared cognitive history)

Spontaneous turn-taking

Experimentally-controlled roles
(isolation of production and comprehension)

What's identical?

Dynamic communicative context
(jointly built, updated according to the fleeting idiosyncrasies of an ongoing interaction)