ESSLLI2022 Advanced Course on Computational Models of Grounding in Dialogue

USC Institute for Creative Technologies

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Lecture 4: Thursday August 11th, 2022

Outline of Course (covered today)

- Preliminaries: representation, agency, communication, definitions & uses for common ground
- Common Ground: How it is modeled and achieved
- Clark & Schaefer's Model of Grounding
- Computational Models of Grounding I: Brennan & Cahn
- Feedback and Error-handling in Spoken Dialogue Systems
- Speech Acts and Dialogue Acts
- Multi-functionality of Utterances
- Computational Models of Grounding II: Traum '94
- **Multi-modal Grounding**
- **Multiparty Multilingual & Multi-floor Grounding**
- **Degrees of Grounding**
- **Incremental Grounding**
- **Use of grounding for other phenomena**

REVIEW OF YESTERDAY

COMPUTATIONAL MODELS OF GROUNDING II: TRAUM '94

Computational Model (Traum 94)

- **Contribution recast as "DU" (Discourse Unit)**
  - (later "CGU") (Common Ground Unit)
- **Finite state network for CGU, tracking state of groundedness**
- **Set of Grounding acts to affect contents and state**
- **Interpretation and generation rules**

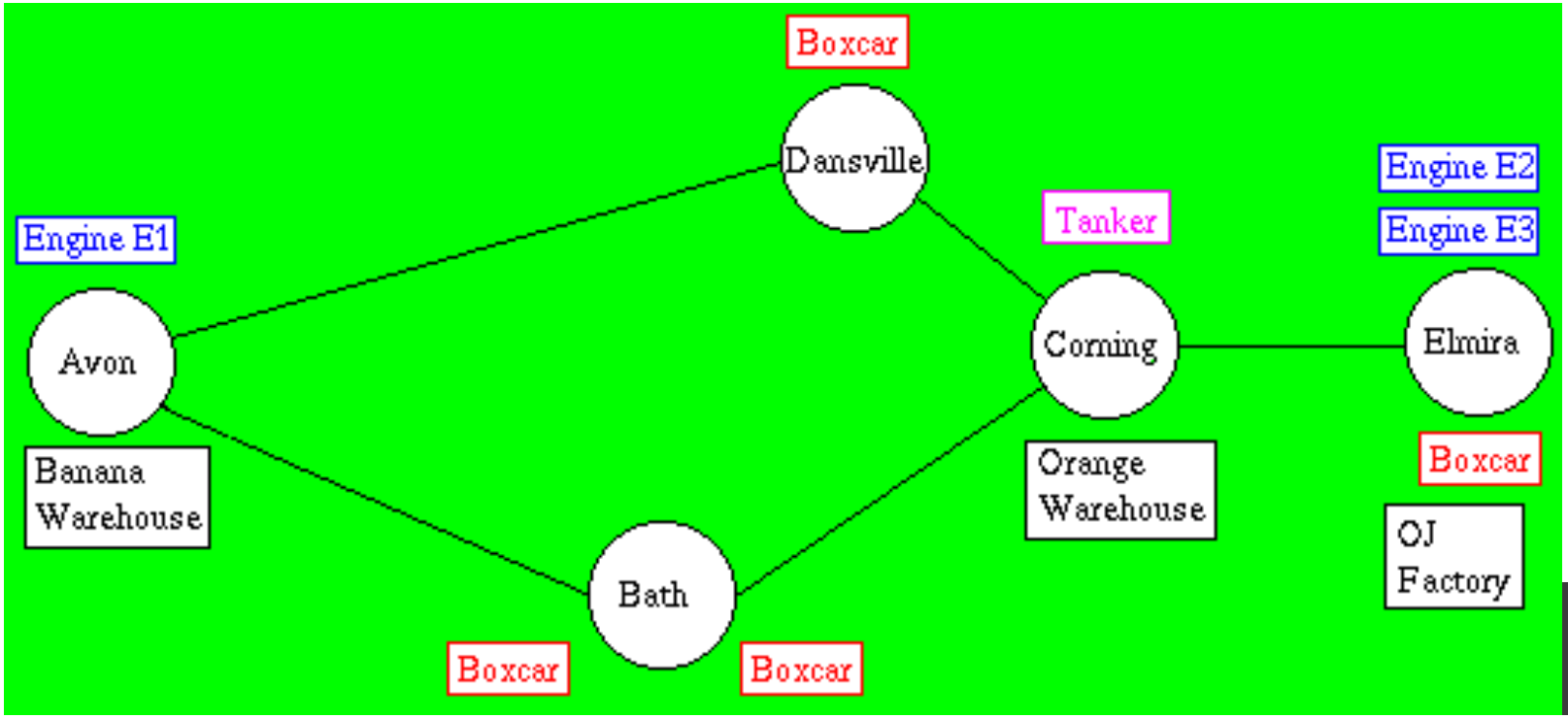
Grounding Automaton

State	Entering Act	Preferred Exiting Act
S	———	Initiate^{I}
1	Initiate^{I}	Ack^{R}
2	ReqRepair^{R}	Repair^{I}
3	Repair^{R}	Ack^{I}
4	ReqRepair^{I}	Repair^{R}
F	$\text{Ack}^{\{I,R\}}$	$\text{Initiate}^{\{I,R\}}$ (next DU)
D	$\text{Cancel}^{\{I,R\}}$	$\text{Initiate}^{\{I,R\}}$ (next DU)

Next Act	In State						
	S	1	2	3	4	F	D
initiate^{I}	1						
continue^{I}		1			4		
continue^{R}			2	3			
repair^{I}		1	1	1	4	1	
repair^{R}		3	2	3	3	3	
ReqRepair^{I}			4	4	4	4	
ReqRepair^{R}		2	2	2	2	2	
ack^{I}				F	1	F	
ack^{R}		F	F			F	
ReqAck^{I}		1				1	
ReqAck^{R}				3		3	
cancel^{I}		D	D	D	D	D	
cancel^{R}			1	1		D	

TRAINS Domain (Allen et al 1994)

```
Manager: We better ship a boxcar of oranges to Bath by eight a.m.      (1.1)
System: OK                                                             (2.1)
Manager: So we need to get a boxcar to Corning, where there are oranges. (3.1)
         There are oranges at Corning.                                 (3.2)
         Right?                                                        (3.3)
System: Right                                                          (4.1)
Manager: So we need an engine to move the boxcar.                      (5.1)
         Right?                                                        (5.2)
System: Right                                                          (6.1)
Manager: So there's an engine at Avon.                                 (7.1)
         Right?                                                        (7.2)
System: Right                                                          (8.1)
Manager: So we should move the engine at Avon, engine E1, to Dansville
         to pick up the boxcar there                                   (9.1)
System: Okay                                                           (10.1)
Manager: and move it from Dansville to Corning                         (11.1)
         load up some oranges in the boxcar                            (11.2)
         and then move it on to Bath                                   (11.3)
System: Okay                                                           (12.1)
Manager: How does that sound?                                          (13.1)
System: That's no problem                                              (14.1)
Manager: Good                                                          (15.1)
```



Grounding Example: Trains Domain

UU#	Speaker: Utterance		Act(s)	DU States 1	2	3	4
3.3	M: let's see	:	$init_1$	1			
3.4	: where are there oranges	:	$cont_1$	1			
4.1	S: the oranges are in the warehouse	:	ack_1,$init_2$	F	1		
4.2	: at Corning	:	$cont_2$	F	1		
5.1	M: oh okay	:	ack_2	F	F		
5.2	: and I see that there's a tanker car there	:	$init_3$	F	F	1	
5.3	: oh we don't want a tanker car do we	:	$cancel_3$	F	F	D	
5.4	: um	:		F	F	D	
5.5	: I have to get a boxcar	:	$init_4$	F	F	D	1
5.6	: to Corning	:	$cont_4$	F	F	D	1
5.7	: and then I have to load it with oranges and eventually I have to get that to Bath	:	$cont_4$	F	F	D	1
5.8	: by 8 o'clock	:	$cont_4$	F	F	D	1
6.1	S: right	:	ack_4	F	F	D	F

Sample Autoroute Dialogue

WIZARD

[1]: How can I help you?

[3]: Where would you like to start?

[5]: Great Malvern?

[7]: Where do you want to go?

[9]: Edwinstowe in Nottingham?

[11]: When do you want to leave?

[13]: Leaving at 6 p.m.?

[15]: Do you want the quickest or the shortest route?

[17]: Please wait while your route is calculated.

CALLER

[2]: A route please

[4]: Malvern

[6]: Yes

[8]: Edwinstowe

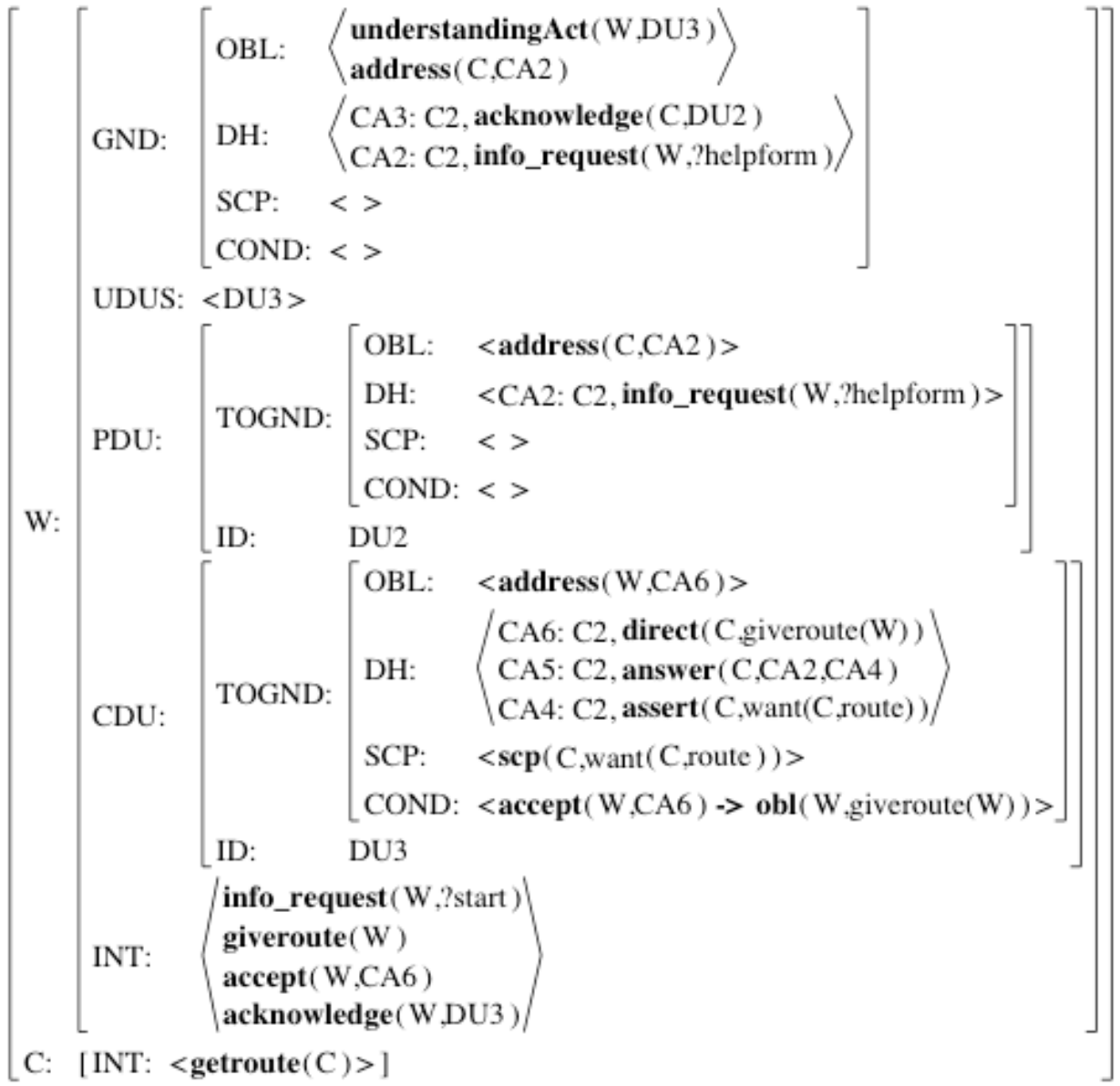
[10]: Yes

[12]: Six pm

[14]: Yes

[16]: Quickest

InfoState after [2]: A route please



Problems with this Model
(later work addressing these issues)

- **Binary grounded/ungrounded decision**
  - No levels of "groundedness" (Roque 2009)
- **Leaves the unit size unspecified** (Visser, DeVault & Traum)
- **Confusability of grounding acts**
  - e.g. repetition = acknowledgment, repair, or request for repair? (Katagiri & Shimojima)
- **Only well-suited for spoken language grounding**
  - Different kinds and meanings of non-verbal feedback (Nakano et al 2003)
  - Less explicit signaling in computer-mediated chat (Dillenbourg & Traum)

Is a positive backchannel evidence of understanding?

- **My claim is that it is the speaker's claim of understanding. So Trustworthy evidence if the speaker is knowledgeable and honest. But not definitive, because speaker could be incorrect or claiming understanding for other purposes.**

Display Act (Katagiri & Shimojima 2000)

- **Problem for Clark & Shaefer 92 & Traum 94: display of responder's understanding might be acceptance/acknowledgement, Repair, request repair**
- **Depends on initiator's determination of (in-)correctness and responder's projected certainty.**
- **Propose lower-level "display" act, that can be interpreted by initiator**

Generating Act (α) Content	Result	Context Target	Generated Act (β)
"uh huh"		following p	acknowledgment
"what?"		following p	repair request
display p	High	following p	acknowledgment
display p'	High	following p	repair
display p	Neutral	following p	acknowledgment
display p'	Neutral	following p	repair request
display p	Low	following p	repair request
display p'	Low	following p	repair request

Table 1: Grounding acts generated by echoic responses.

Di Maro (2021) review of work relating to each of the types of grounding act from Traum (1994).

Grounding Act	References
Initiate	(Dahlbäck and Jönsson 1998)
Continue	(Schlangen and Skantze 2011) (Visser et al. 2012) (Visser et al. 2014)
Acknowledgement	(Skantze, House, and Edlund 2006) (Wang, Lee, and Marsella 2013) (Visser et al. 2012, 2014) (Eshghi et al. 2015) (Buschmeier 2018) (Buschmeier and Kopp 2018) (Schlangen 2019)
Repair	(Skantze 2008) (Swerts, Litman, and Hirschberg 2000) (Hough and Purver 2012) (Marge and Rudnicky 2015) (Purver, Hough, and Howes 2018) (Di Maro et al. 2019) (Marge and Rudnicky 2019)
Cancel	N/A
RequestRepair	(Gabsdil 2003) (Rodríguez and Schlangen 2004) (Purver 2004a) (Schlangen 2004) (Purver 2006) (Stoyanchev, Liu, and Hirschberg 2014) (Müller, Paul, and Li 2021)
RequestAcknowledgement	(Misu et al. 2011) (Buschmeier and Kopp 2014)

MULTI-MODAL GROUNDING

Multimodal Grounding: Key questions

- What evidence signals can be performed in modality
- What affordances (constraints) does modality place on achieving/assuming common ground?
- Multifunctionality
- Within and cross-grounding

Clark & Brennan ’91: Media constraints on Grounding

SEVEN MEDIA AND THEIR ASSOCIATED CONSTRAINTS

Medium	Constraints
Face-to-face	Copresence, visibility, audibility, cotemporality, simultaneity, sequentiality
Telephone	Audibility, cotemporality, simultaneity, sequentiality
Video teleconference	Visibility, audibility, cotemporality, simultaneity, sequentiality
Terminal teleconference	Cotemporality, sequentiality, reviewability
Answering machines	Audibility, reviewability
Electronic mail	Reviewability, revisability
Letters	Reviewability, revisability

Media and Activity factors in Grounding

- **Clark and Brennan 90**
  - Media influences amount and type of grounding
- **E.g., Traum & Heeman '96: Trains Domain, spoken language, no visual contact**

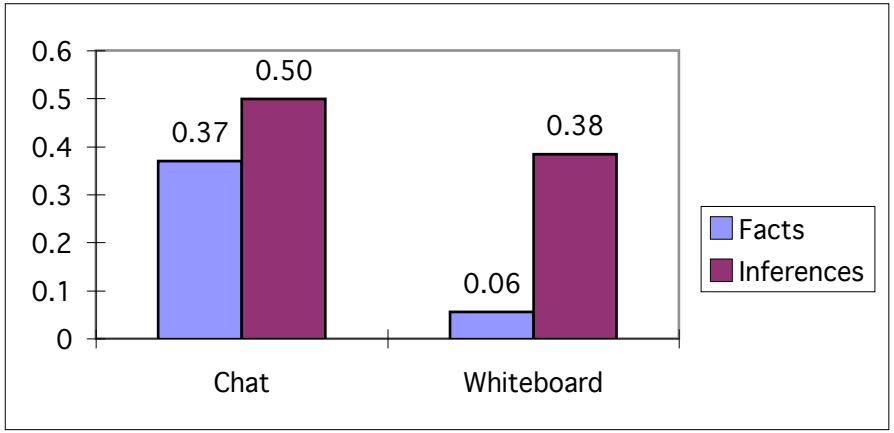
Category	% utterances
Explicit Ack	52%
Related	29%
Unrelated after Explicit	15%
Other Unrelated	3%
Uncertain	2%

Dillenbourg & Traum 96, 05
Multi-modal computer-mediated grounding

- **Grounding by category**

Content of interactions	Acknowledgment Rate
Task knowledge	38%
Facts	26%
Inferences	46%
Task management	43%
Meta-Communication	55%
Technical problems	30%
All categories	*41%*

- **Grounding by Category & Medium**



Factors Affecting Grounding Behavior

- **Amount of grounding, type of act, content & realization of act, and model for groundedness depends on a number of factors including**
  - Purposes & prior groundedness (Grounding Criterion)
  - Available communication channels and resources
    - Costs and affordances: Clark and Brennan '90
    - Traum & Heeman '96: only 3-5% of utterances in spoken trains corpus had no grounding
    - Dillenbourg & Traum '96, 05: over 50% of utterances in typed MOO mystery solving dialogues had no grounding
  - Content
    - Dillenbourg & Traum '96, 05
    - Sometimes shared situation model is better than explicit grounding model (for facts on shared whiteboard)

Impact of grounding rate on repetition

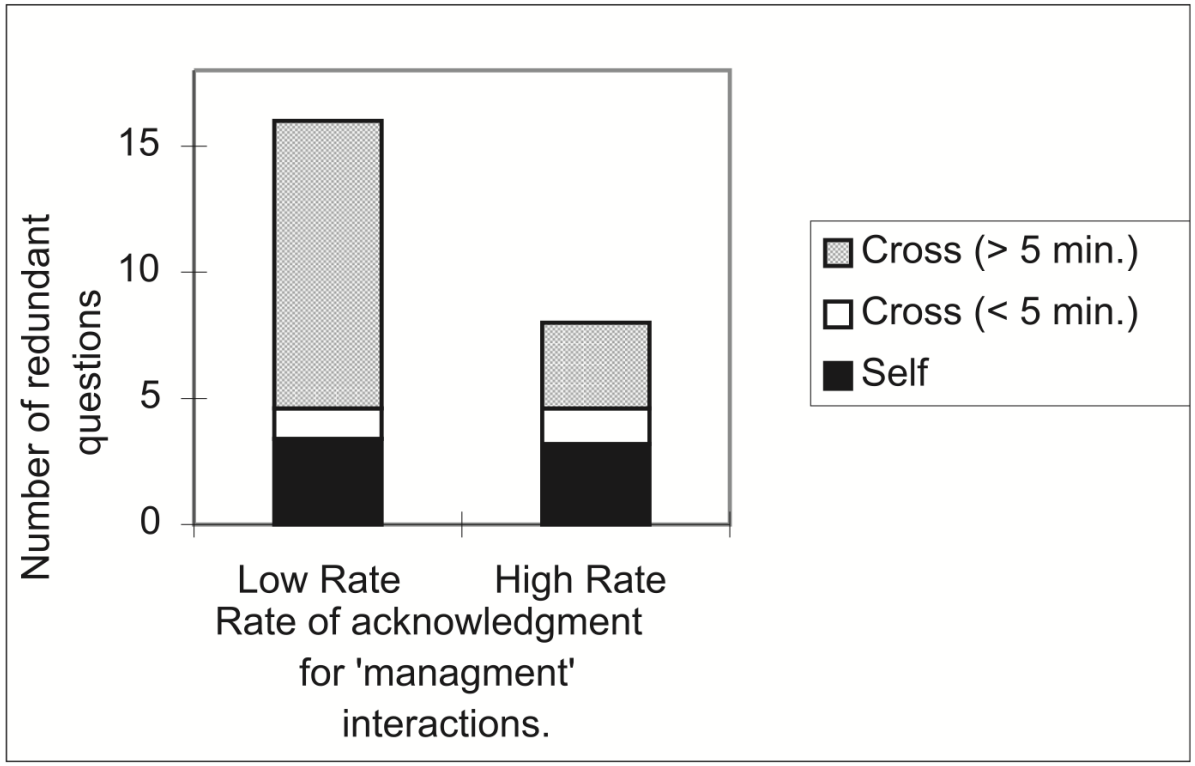


FIGURE 3 Comparison between the number of redundant questions asked by the low acknowledgers (on task management interactions) and high acknowledgers.

Towards a Model of Face-to-Face Grounding

Yukiko Nakano (RISTEX)

Gabe Reinstein & Tom Stocky (Media Lab)

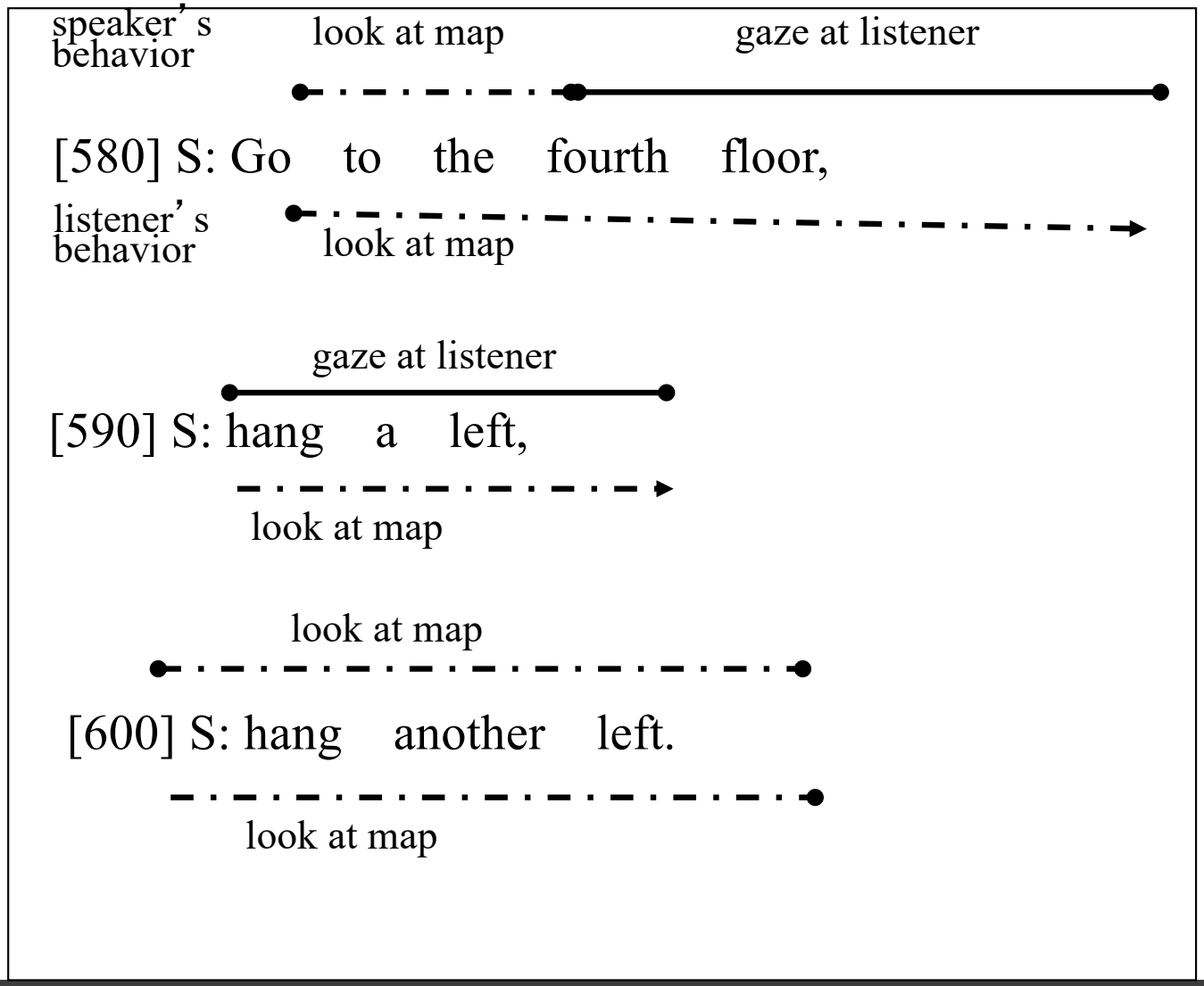
Justine Cassell (MIT Media Lab & Northwestern University)

Questions

- How do people use nonverbal behaviors to ground information in face-to-face?
- How can a model of face-to-face grounding be applied to human-computer interaction?

Example

S is giving a direction while sharing a map with H



- Speaker goes ahead without getting verbal acknowledgement.
- In face-to-face conversation where conversational participants share a task, focus of attention on the task seems a signal of understanding.

Empirical Study

- **Task: Students from 2 universities give directions to one another**
- **Design**
  - Face-to-face condition (F2F): two subjects share a map drawn by the direction-giver sitting between them.
  - Shared reference condition (SR): L-shaped screen lets them share a map, but not see the other's face and body.

Data Coding

- **Coding verbal behaviors**
  - Unit of analysis: Utterance Unit (corresponds to single intonational phrase. [Nakatani & Traum 1999])
  - Categories of UUs: using part of DAMSL coding scheme
    - Acknowledgement
    - Answer
    - Information-request (Info-req)
    - Assertion
- **Coding nonverbal behaviors**
    - Gaze at Partner (gP)
    - Gaze at Map (gM)
    - Gaze Elsewhere (gE)
    - Head Nod (Nod)

Coding of NV Status of Dyad

Combinations of NVs		Listener's behavior			
		gP	gM	gMwN	gE
Speaker's behavior	gP	gP/gP	gP/gM	gP/gMwN	gP/gE
	gM	gM/gP	gM/gM	gM/gMwN	gM/gE
	gMwN	gMwN/gP	gMwN/gM	gMwN/gMwN	gMwN/gE
	gE	gE/gP	gE/gM	gE/gMwN	gE/gE

Nonverbal status shift within and between a UU were counted, and used as nonverbal data.

Results: Effect of Access to Body

- **In non-F2F, speakers present information in smaller chunks and take more time. In F2F, more information is conveyed in one UU, which takes less time.**
- **The number of NV shifts in non-F2F is less than half of F2F**
- **Therefore, access to interlocutor's body affects conversation, suggesting that nonverbal behaviors used as communicative signals.**

Mean length of conversation (min)	F2F (3.24) < SR (3.78)	p<.07
Mean length of Utterance Unit (UU) (words)	F2F (5.26) >SR (4.43)	p<.01
The number of NV shifts	F2F (887) > SR (425)	p<.01

Results: NVs as Communicative Signal

- **Correlation between verbal and nonverbal behaviors**

	Shift to	
	within UU	pause
Acknowledgement	*gMwN/gM* (0.495)	*gM/gM* (0.888)
Answer	*gP/gP* (0.436)	*gM/gM* (0.667)
Info-req	*gP/gM* (0.38)	*gP/gP* (0.5)
Assertion	*gP/gM* (0.317)	*gM/gM* (0.418)

- Usage of nonverbal signals is different depending on type of conversational action.
- Therefore, these are used as positive evidence of understanding in F2F conversation.

Results: Function of NV Signals

- **Correlation between speaker and listener behavior**

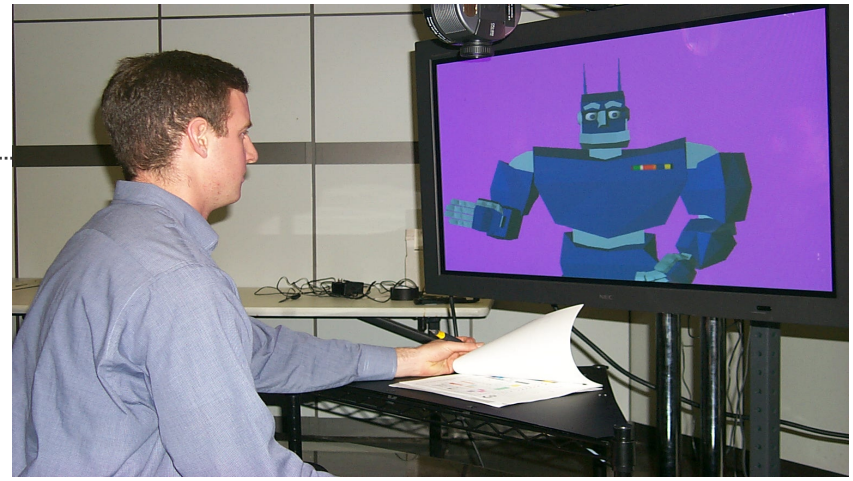
  How listener's nonverbal signals affects speaker's following action

```
[U1] S: And then, you'll go down this little
        corridor.
[U2-a] S: It's not very long. (elaboration)
[U2-b] S: Then, take a right. (go-ahead)
```

- In Assertion, when listener keeps gazing at speaker, speaker's next UU is an elaboration of previous UU 73% of the time.
- When listener keeps gazing at map, only 30% of next UU is elaboration.
- Therefore, speakers interpret listeners' continuous gaze as evidence of not-understanding, and add more explanation for ungrounded message.

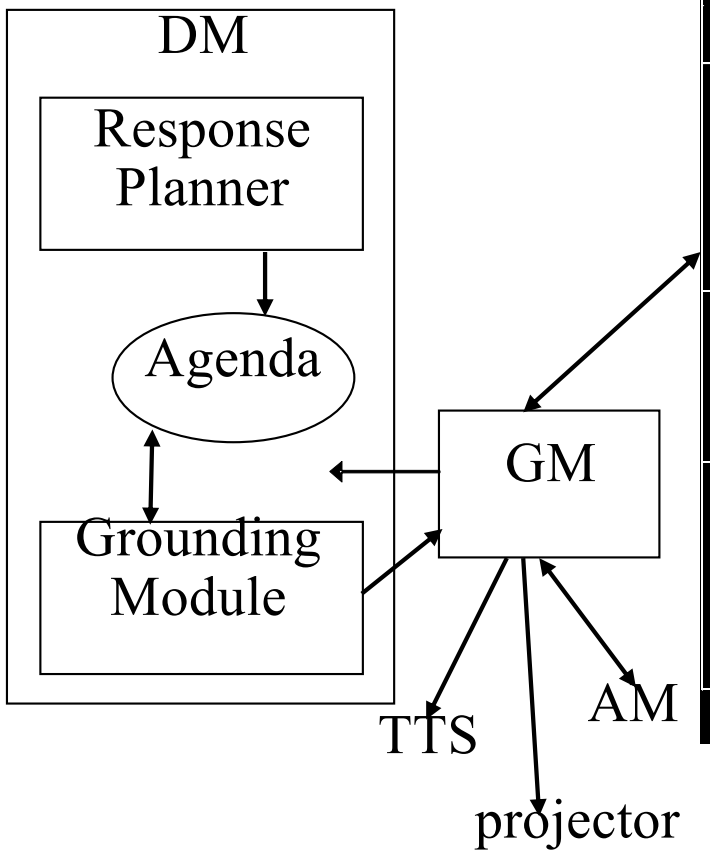
System: MACK

Media lab Autonomous Conversational Kiosk



- **Appearance**
  - *Life-sized animated robot*
- **Knowledge base**
  - *Media Lab's projects, research groups, and directions about how to find them.*
- **Input**
  - *Speech*
  - *Pen gestures on shared paper map*

Generating Nonverbal Signals



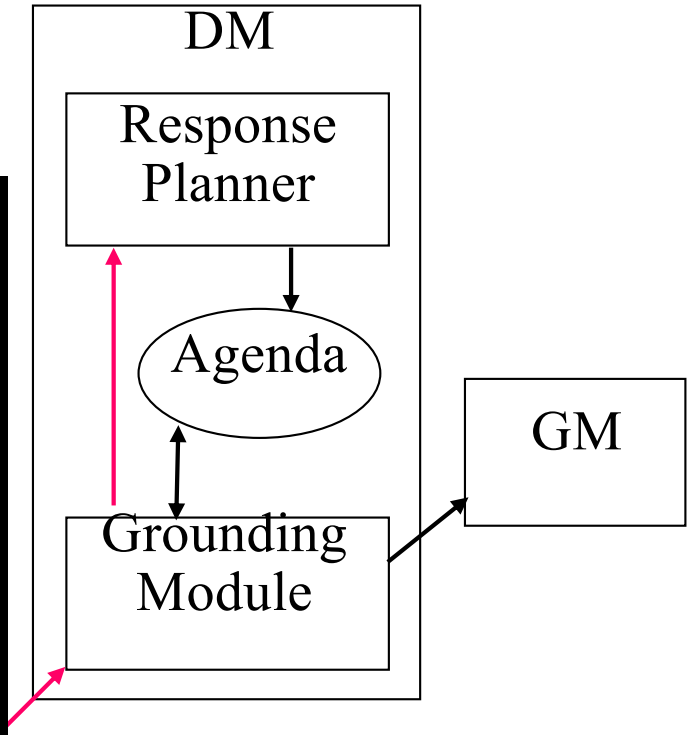
Mack's nonverbal signals

UU type	probability	MACK nonverbal behavior	
		within UU	pause
Assertion	0.66	keep *gM*	*gM*
	0.14	shift *gM* to *gP*	*gP*
	0.11	shift *gM* to *gP*	*gM*
	0.09	keep *gP*	*gP*
Answer	0.45	keep *gM*	*gM*
	0.36	keep *gP*	*gP*
	0.18	shift *gM* to *gP*	*gP*
Elaboration	0.47	keep *gP*	*gP*
	0.2	keep *gP*	*gM*
	0.2	keep *gM*	*gM*
	0.13	shift *gM* to *gP*	*gP*

Determining Next Action

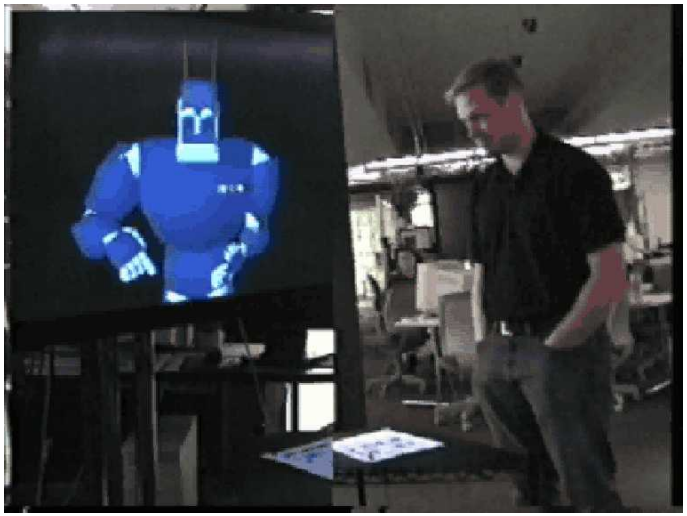
Decision table for the next action

Target UU Type	Grounding judgment	Suggested next action
Assertion	grounded	go-ahead: 0.7 elaboration: 0.30
	ungrounded	go-ahead: 0.27 elaboration:0.73
Answer	grounded	go-ahead: 0.83 elaboration: 0.17
	ungrounded	go-ahead: 0.22 elaboration: 0.78



Preliminary Evaluation

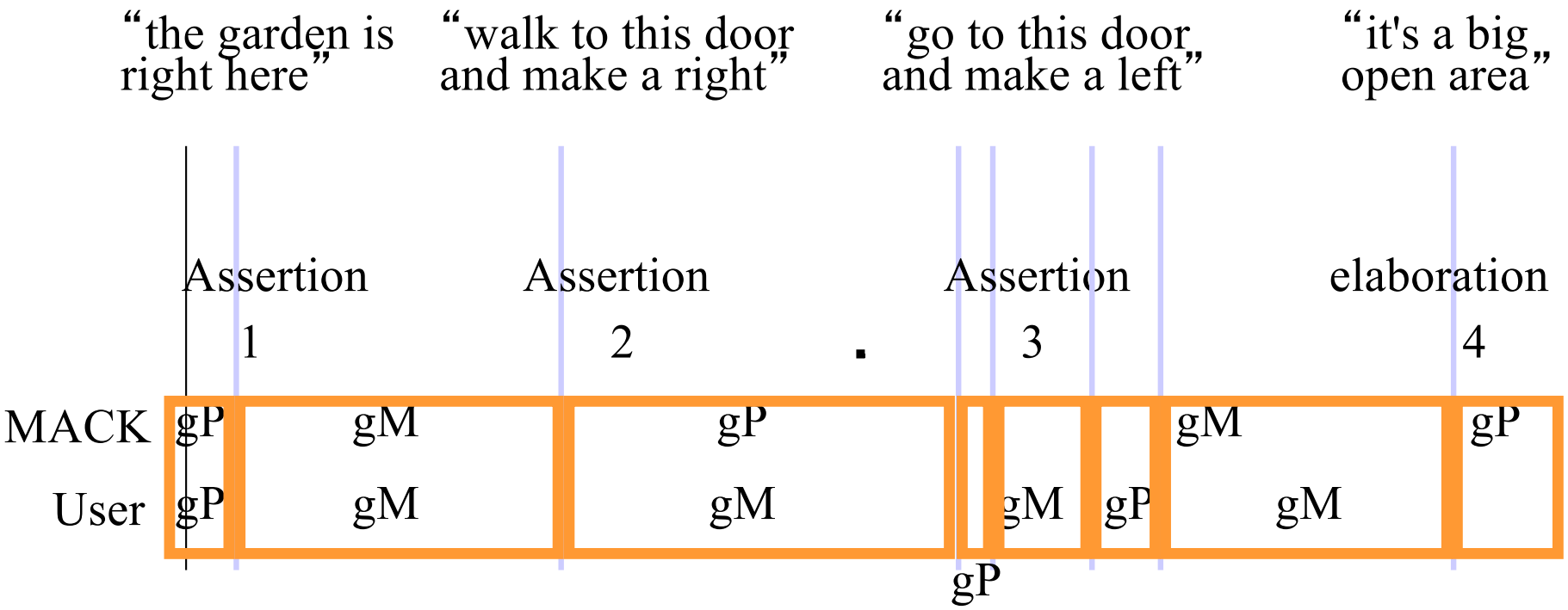
- **Do human users interact with MACK as we expect?**
  - Wizard of Oz setting
  - Naïve users
  - Two versions of MACK



(a) MACK-with-grounding

(b) MACK-without-grounding (neither recognize user's nonverbal signals nor display nonverbal signals of grounding)

Human and MACK-with-grounding



-The NV transition patterns in MACK-with-grounding condition are strikingly similar to those in our empirical study of human-human communication.
-In Without-Grounding condition, user broke these conventions: neither nodded nor spoke.

Conclusion

- **Empirical results demonstrate nonverbal behaviors used as positive/negative evidence of understanding.**
- **Usage of NV different depending on type of verbal action.**
- **Based on these results, face-to-face grounding mechanism for ECA.**
- **Preliminary evaluation supports model, and shows MACK's potential for interacting with a human user using human-human conversational protocols.**

Assessing Differences in Multimodal Grounding with Embodied and Disembodied Agents

Eugenia Hee, Ron Artstein, Su Lei,
Cristian Cepeda, David Traum

USC Institute for Creative Technologies

University of Southern California

Questions

1. **Do people engage in multi-modal grounding with artificial agents (embodied virtual humans, robots)?**
2. **What kinds of feedback functions are used?**
3. **What behaviors are used to express the functions?**
4. **Is the amount and type of grounding sensitive to**
   A. The collaborative task
   B. The agents
   C. The embodiment of agents

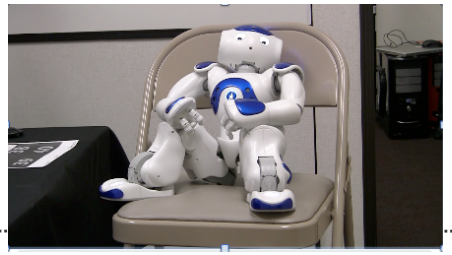
Initial Grounding Annotation Focus: Provide feedback at 2 levels (Adapted from MUMIN Allwood et al 2007)

- **Functions annotated**
  - Provide Feedback of
    - Understanding
      - Understanding
      - Non-understanding
    - Attitudinal Reaction
      - Agreement
      - Disagreement
- **Feedback providing behaviors**
  - Verbal
    - Utterance
    - Laugh
  - facial displays
    - head shake
    - head nod
    - eyebrow movement
    - other

Data to Annotate: Niki and Julie Corpus

- **Corpus Overview**
  - 2 agents (Niki robot and julie virtual human)
  - 2 embodiment conditions: Julie embodied or voice only)
  - 4 tasks (3 ranking, 1 casual)
  - 40 participants, interacted with subset of agents in each task)

Agents



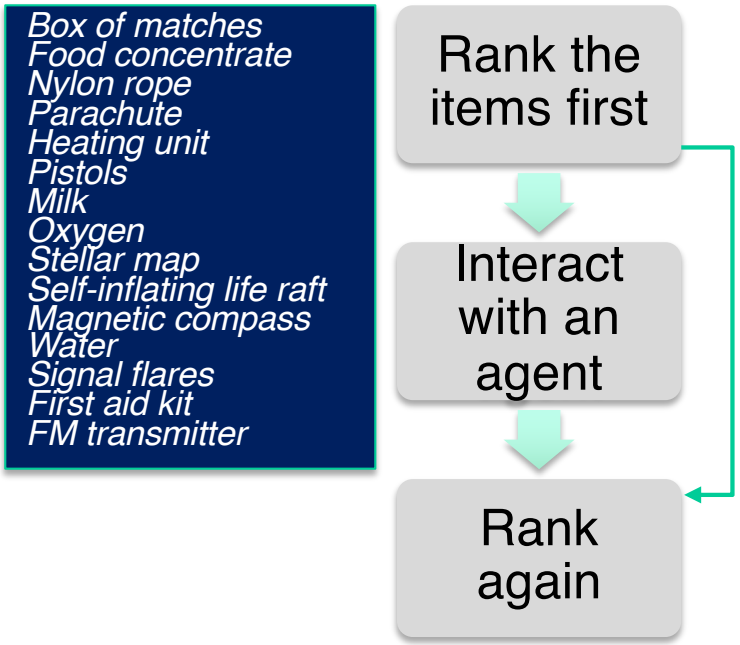
- **Niki Nao**
- **Small, cute robot**
  - Humanoid, body but limited facial expressions

- **Julie**
- **Embodied Virtual Human (for rapport-building exercise only)**
- **Voice-only (telecon) for ranking tasks**

Study Design: Tasks

- **3 Ranking Tasks:**
  - Desert Survival
  - Lunar Survival
  - Save the Art
- **1 Rapport-building task**
  - “Get to know you” dialogue

Lunar Survival Task



- Test in standard team persuasion task
  - Lunar survival task
- Measure Influence as change in participant's ranking toward agent's ranking

NASA Exercise: Survival on the Moon

Julie Lunar

Desert Survival Ranking Task

- _____Flashlight with 4 batteries (1)
- _____ Folding knife (2)
- _____ Air map of the area (3)
- _____ Plastic raincoat (large size) (4)
- _____ Magnetic compass (5)
- _____ First-aid kit (6)
- _____ A cosmetic mirror (7)
- _____ Parachute (red and white) (8)
- _____ 2 quarts of water per person (9)
- _____ Overcoat (one each) (10)

Save the art ranking items

- **THE SITUATION You are one of three crisis managers for the Los Angeles County Art Museum art evacuation mission. A fire is heading towards the museum. While all the people can be successfully evacuated, there is only a limited amount of transport available to save the art. You have been able to requisition 10 transport vehicles, which will arrive in 15 minutes. Each of the vehicles can carry only one piece of art, for insurance reasons. Unfortunately, only one vehicle can approach the loading area at a time, and you do not know exactly when the fire will arrive, so it is important to rank the paintings in order of priority for saving. Your task is to rank the 10 art pieces according to their importance for saving. After your initial rankings you may have a conversation with two other managers, (Julie and Niki) you will have a chance to update your rankings. Sort the items below so that the most important item is placed first, the second most important is placed second, and so on through to number 10 for the least important.**

Flora, Francesco Melzi (oil on canvas)

Mambila Figure, Nigeria, unknown (wood)

Gayer-Anderson Cat, unknown (bronze statue)

Basket of Flowers by Rachel Ruysch (oil on canvas)

Madonna & Child, unknown (ceramic)

Olympians, unknown (marble sculpture)

Gundestrup Cauldron, Celtic, unknown (silver, gold, tin, glass)

The Last Day of Pompeii, Karl Pavlovich Briullov (oil on canvas)

Evening Snow at Kanbara by Utagawa Hiroshige (woodblock print; ink and color on paper).

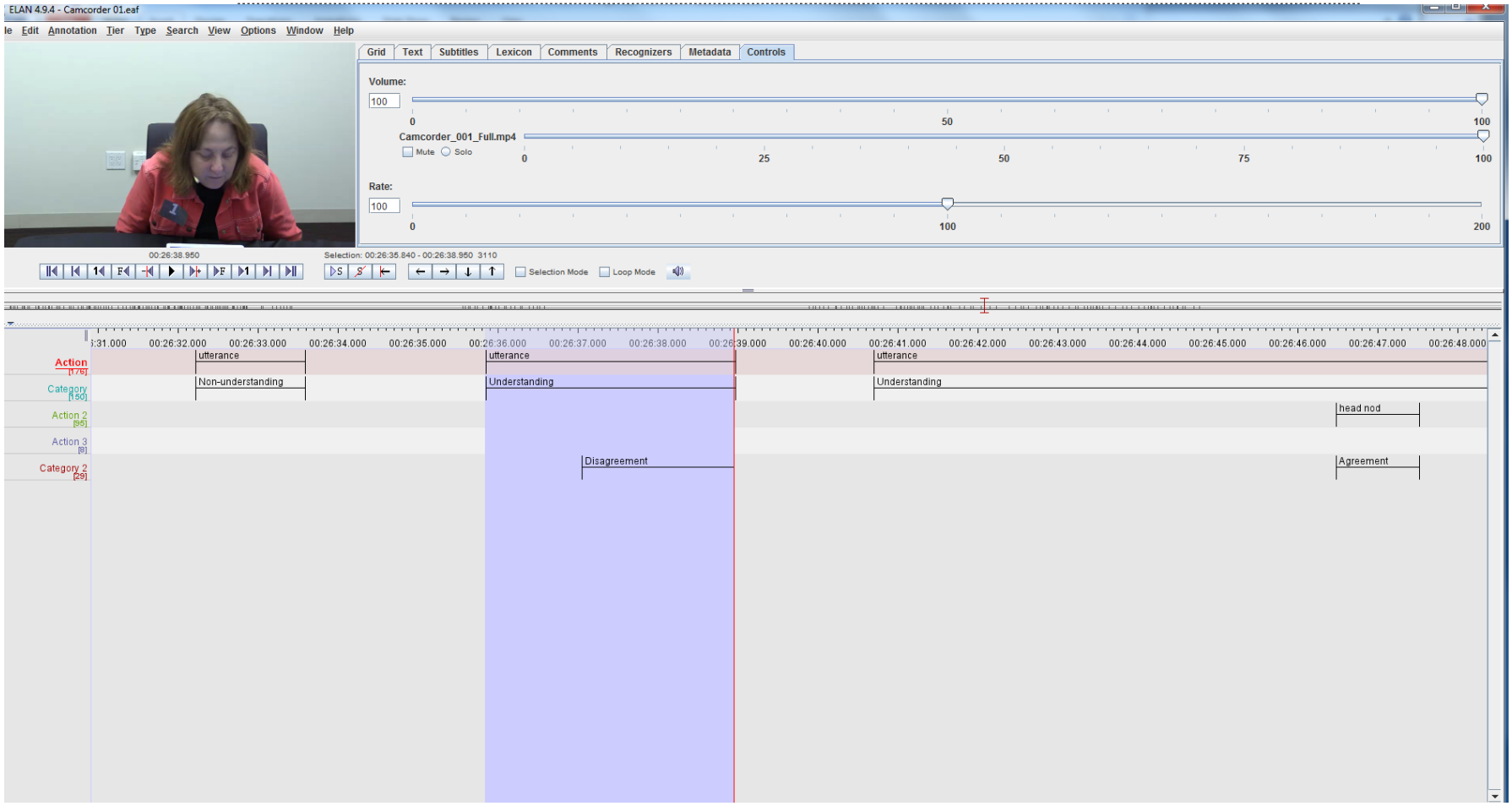
Carnival on the Grand Boulevards, Raoul Dufy (oil on canvas)

Art Task

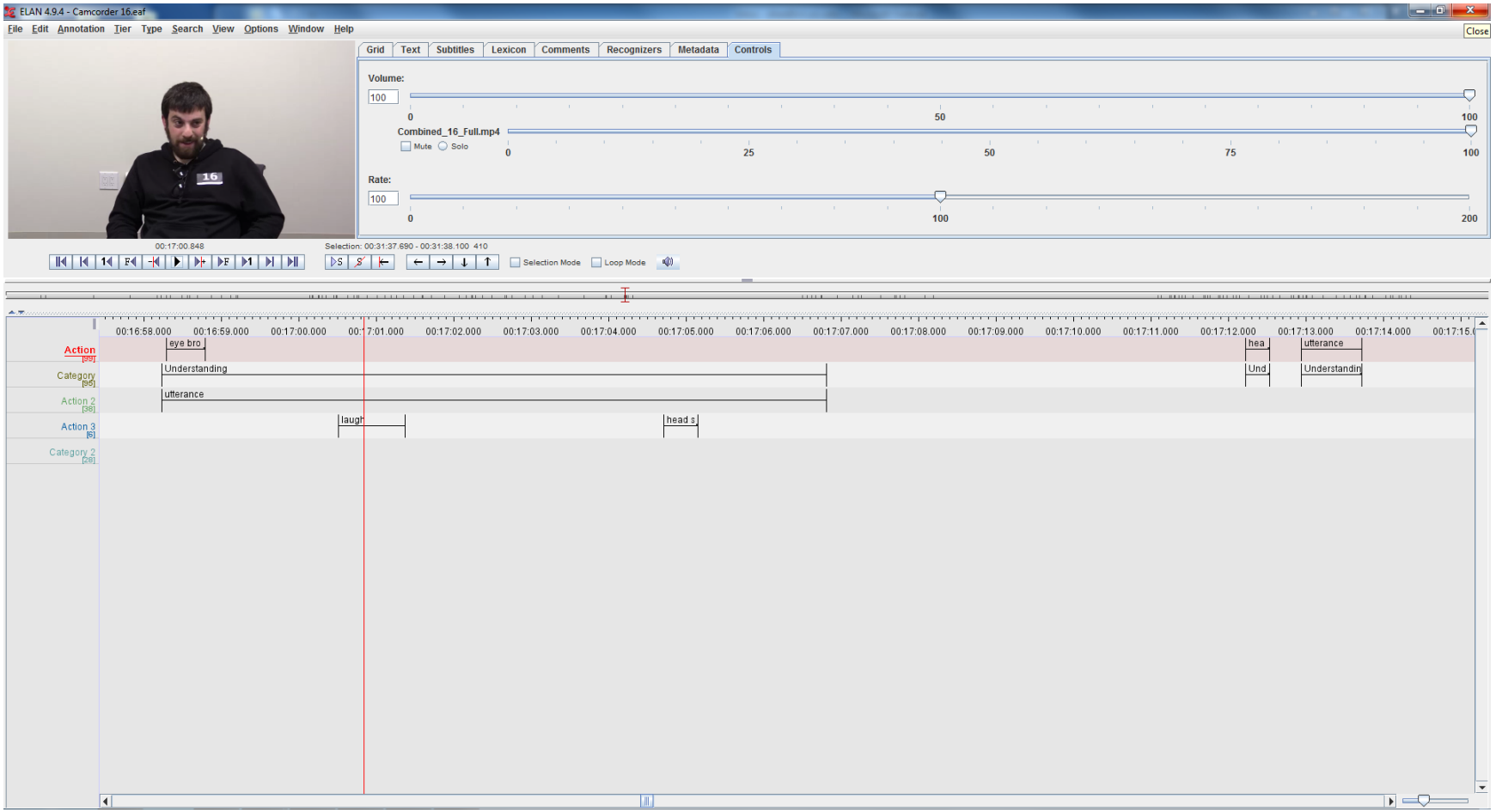
Ice-breaker Niki

Ice-breaker Julie

Annotation of Functions and behaviors in ELAN



ELAN Annotations



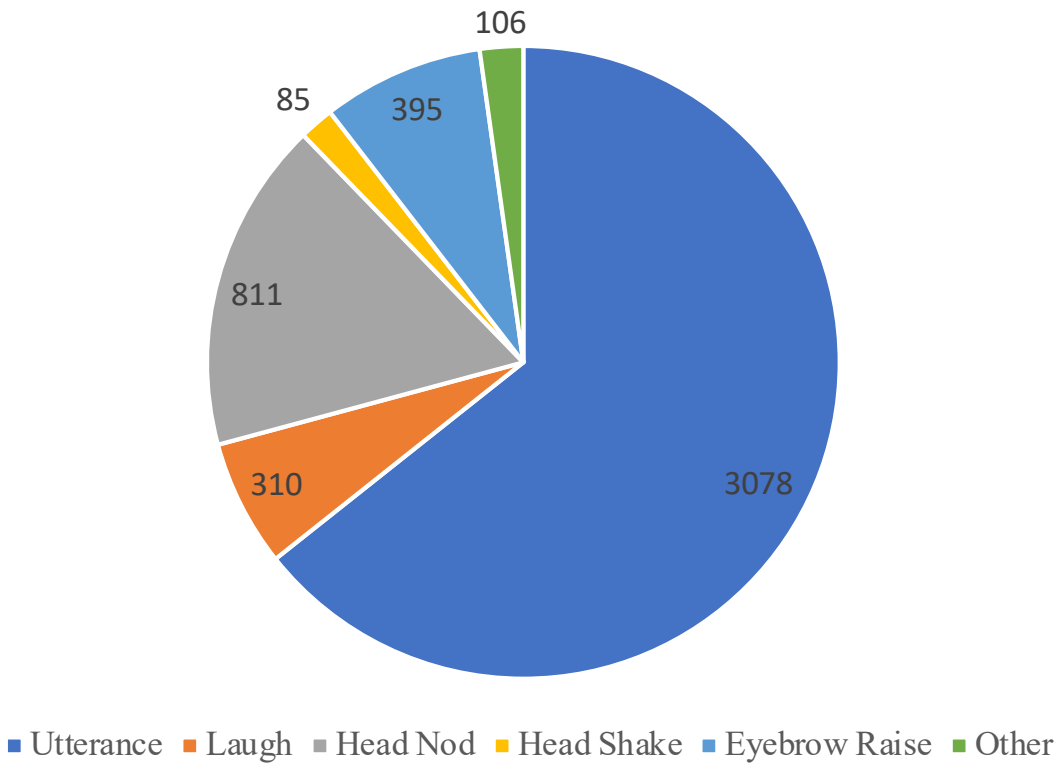
Analysis of Annotations

- **Amount and distribution of behaviors**
  - By agent
  - By agent and task
- **Function totals and distribution**
- **Individual differences in distributions**
- **Correlation of Function-frequency and influence per agent/task**

Behavior Totals

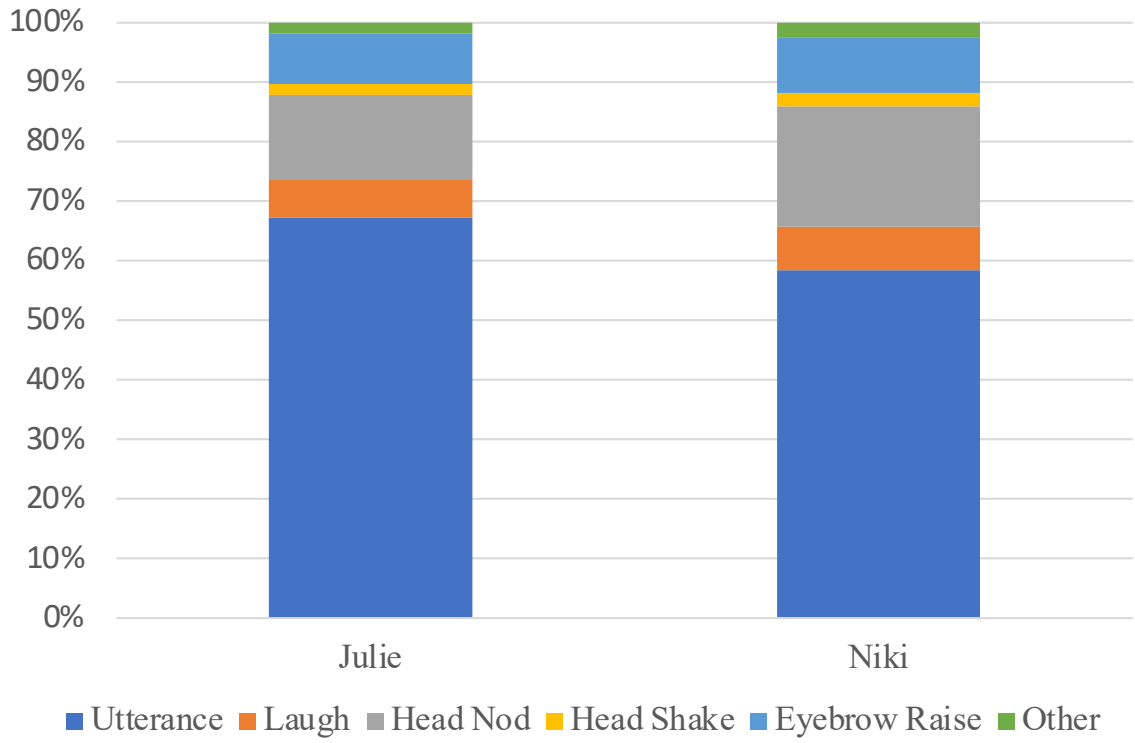
- **Across all tasks:**

- **3078 utterances,**
- **310 Laughs**
- **811 head nods**
- **85 head shakes**
- **395 Eyebrow raise**
- **106 Other grounding behaviors**

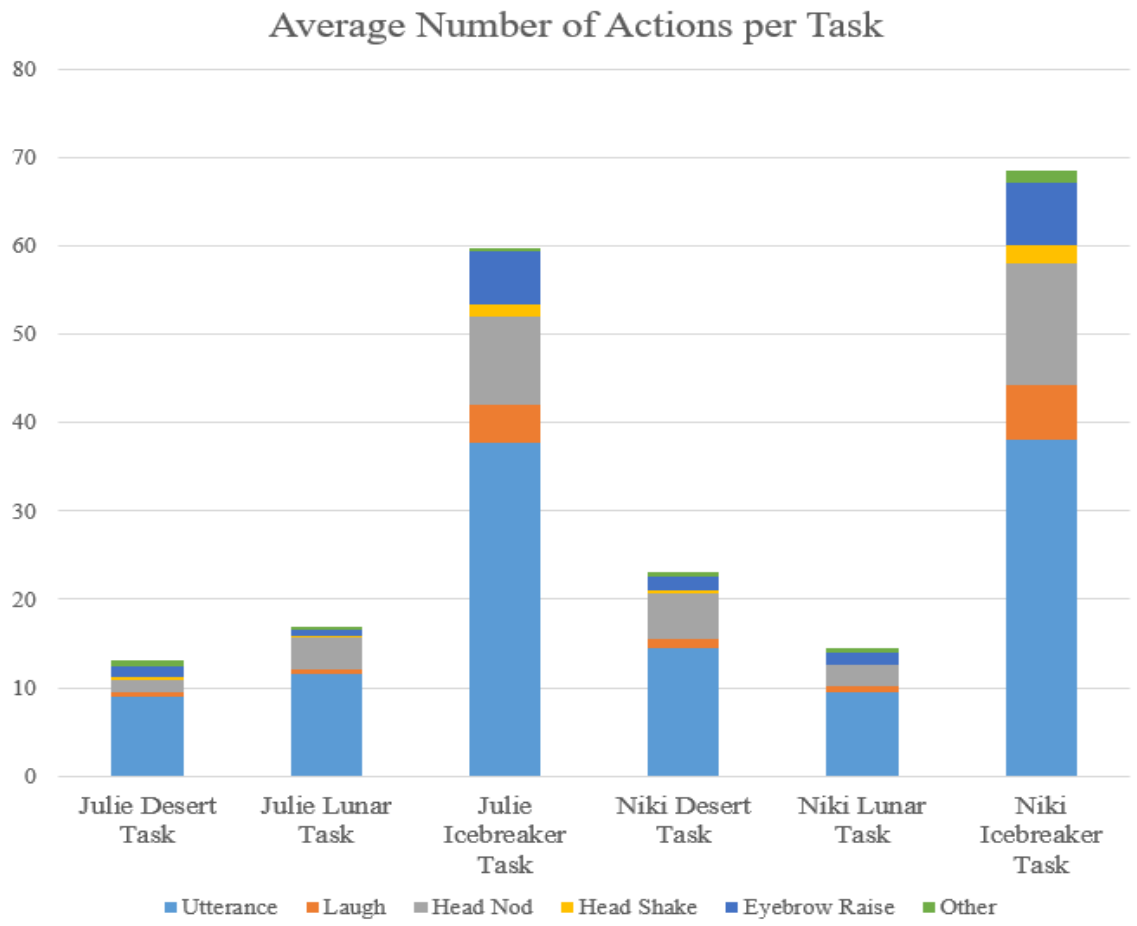


Behavior ratios to different agents

- **Julie: relatively more utterances**
- **Niki: higher percentage of other behaviors**

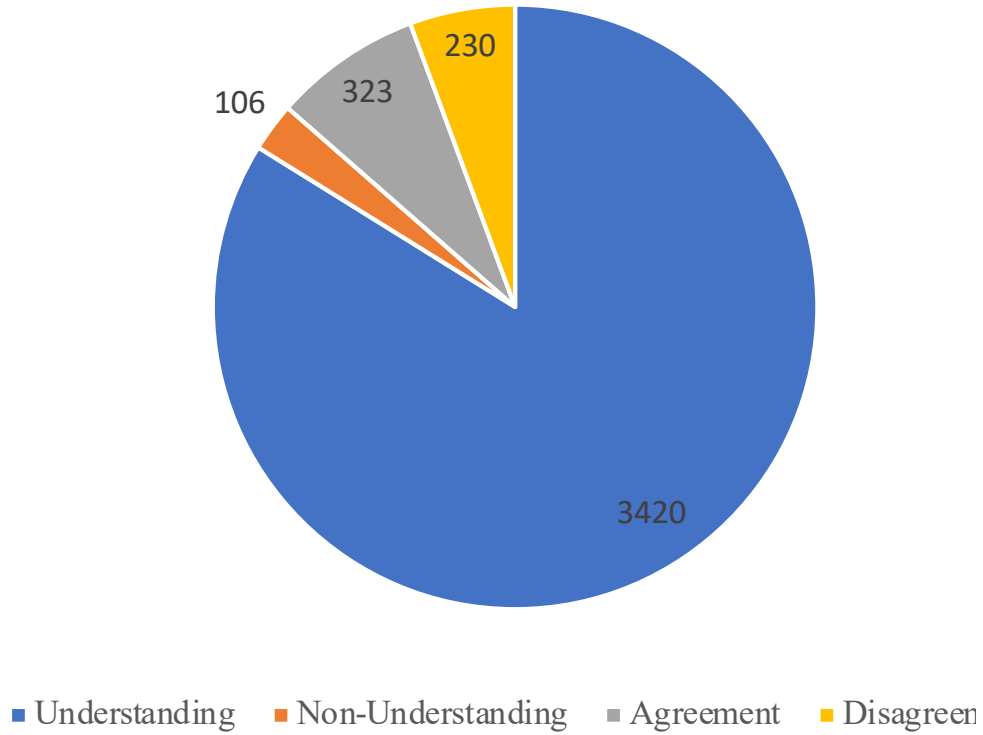


Average Grounding Behaviors per task and agent

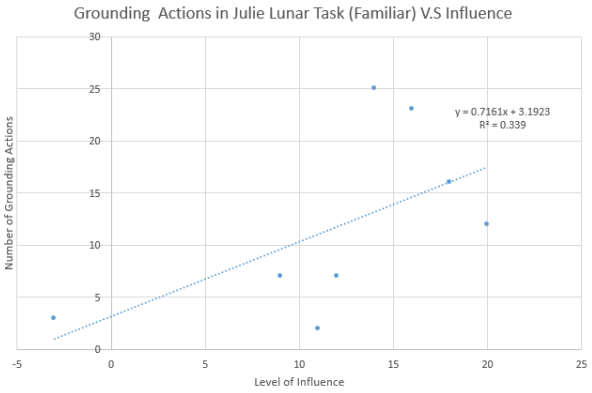


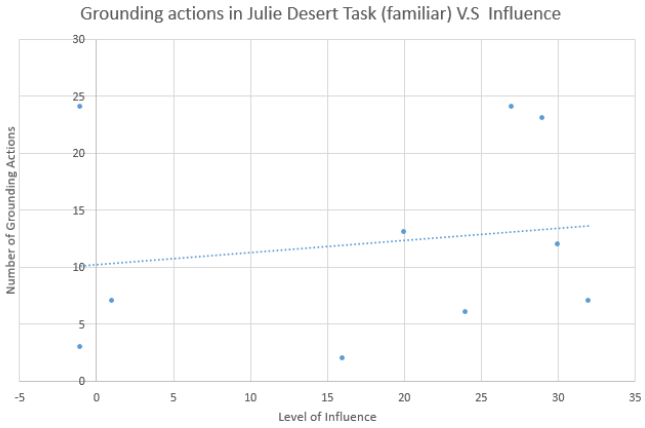
Function Totals

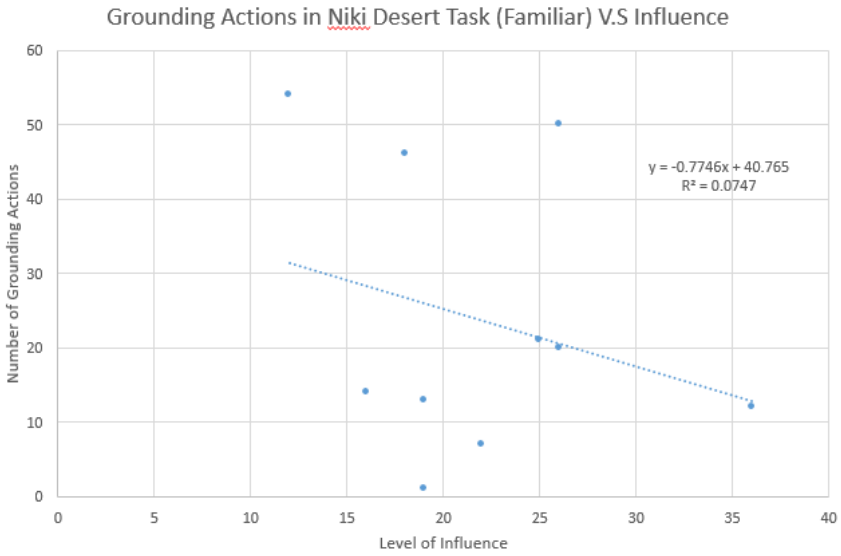
- **3420 Understandings**
- **106 Non-understandings**
- **323 Agreement**
- **230 Disagreement**
  - Significant difference between agreement and disagreement $F(1,76) = 3.06$, $p=0.08$



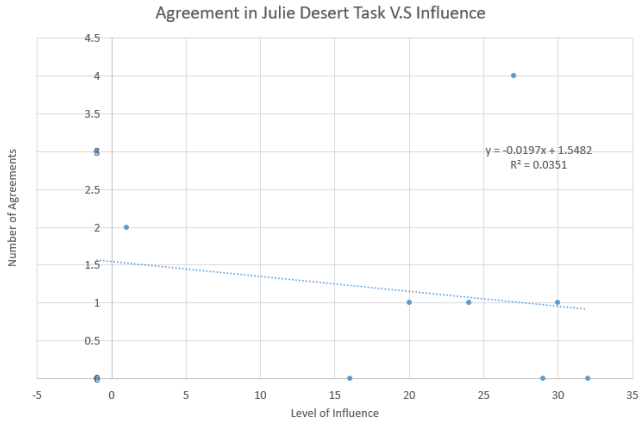
Grounding vs influence

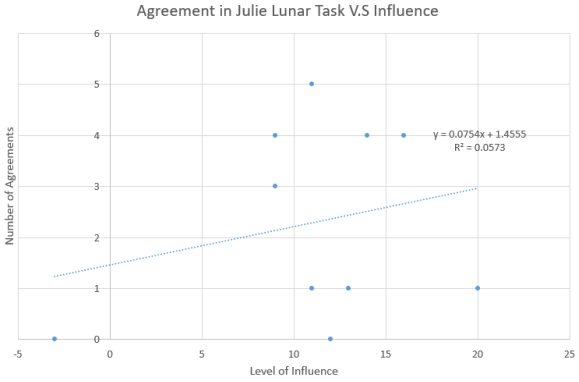


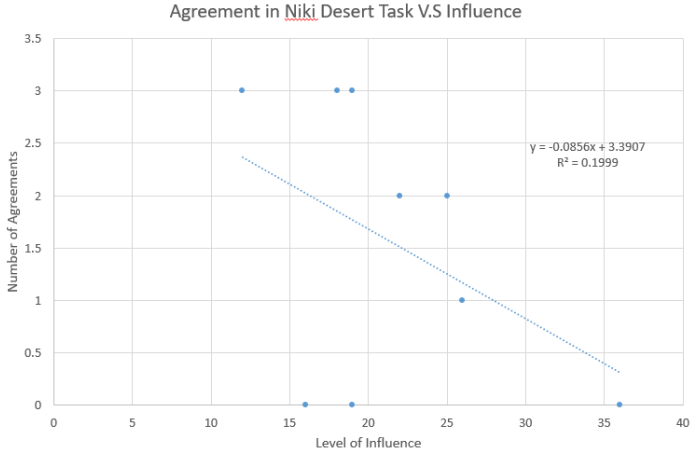


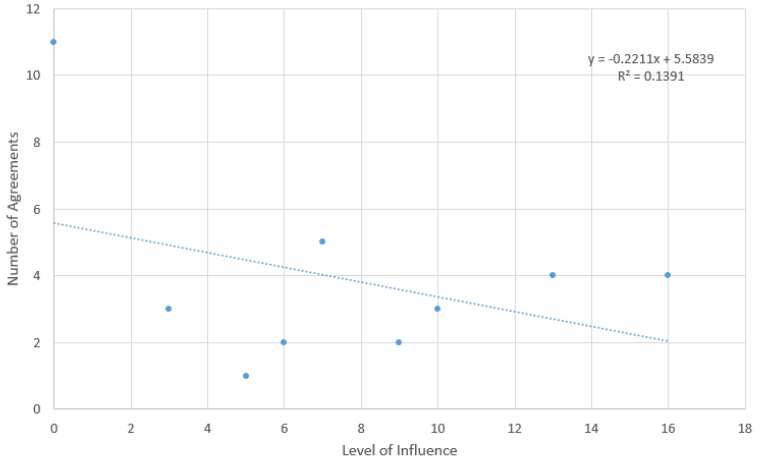


Agreement vs influence









Summary

- **People provide a lot of multimodal feedback to virtual agents**
  - Even non-verbal to disembodied voice
  - More non-verbal to physical robot
  - Differences based on task, agent, and individual
  - No clear correlation to influence (positive for grounding in general, and negative for disagreement, agreement differs by agent)

Further Questions

- **Is there a relationship between feedback actions and level of rapport or trust?**
- **Analysis of multimodal behaviors for same function**
- **Other kinds of feedback**
- **How do feedback actions from the agents impact feedback actions in the participants? (Hendrik's talk, next)**
- **Can more detailed common ground models predict influence**

Role of embodiment and human-like grounding behavior (Kontogiorgos et al 2021)

- Role of embodiment
  - Social robot allows non-verbal grounding behavior
    - gaze cues, facial expressions and gestures
- Role of errors
  - Low vs high severity
- Robot Cooking domain
  - Speaker/Robot makes cooking task requests

Robot cooking instructor

```
USER:   [FINISHED-ACTION] So, what's next?
ROBOT:  [INSTRUCTION] Next, take three pieces of lettuce
         and put it in the spring roll.
USER:   [HESITATION] ...
USER:   [CLARIFICATION-Q] Ehm, where is the lettuce?
ROBOT:  [CLARIFICATION-A] The lettuce is the green thing
         in the middle.
USER:   [LOOKS-AT-INGREDIENT]
USER:   [STARTED ACTION] Uh, yes! Okay!
USER:   [ACTION-IN-PROGRESS]
USER:   [FINISHED-ACTION] Okay, what's next?
```

Research Questions

- **RQ 1:** What are the effects in human grounding behaviour when manipulating **robot embodiment** and **social behaviour** during task-oriented dialogue?
- **RQ 2a:** How do different robot embodiments affect people's grounding behaviours after **conversational failure**s?
- **RQ 2b:** Does **failure severity** interact with the above manipulations and with people's grounding behaviours?

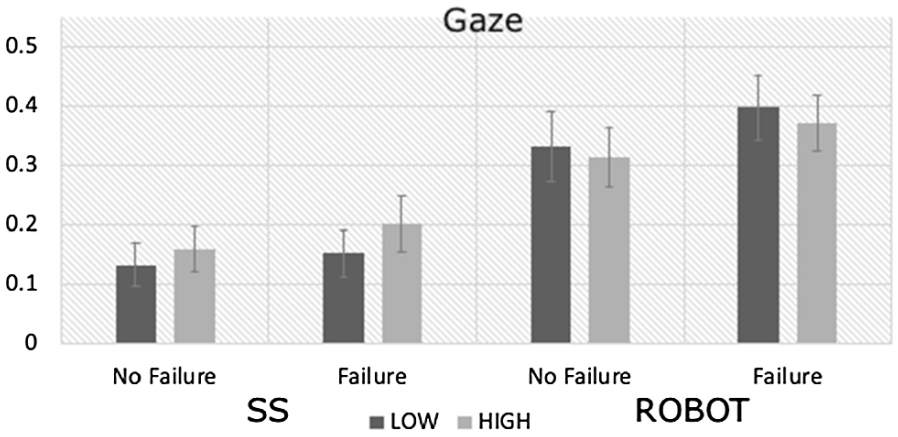
Experiment 1: Robot Embodiment

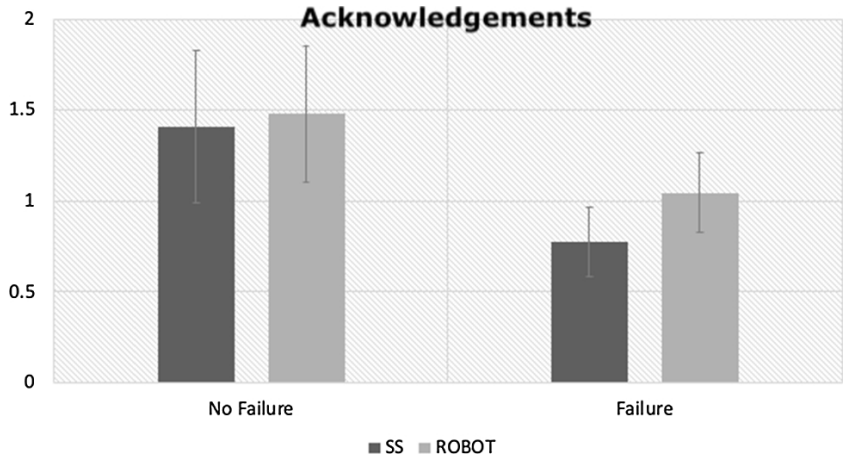
- **Agent Embodiment**
  - Smart Speaker (Echo)
  - Robot with no gaze
  - Robot with gaze (Furhat)
- **Results**
  - Humans gazed more at robot, but also took longer and had more clarification questions and acknowledgements
  - Robot with no gaze like speaker in terms of gaze and time, but mor elike robot with respect to acknowledgm,ents

Experiment 2: Robot failures

```
USER:   [FINISHED-ACTION] Okay I'm ready, what's next?
ROBOT:  [INSTRUCTION] Next, take three pieces of cucumber
         and put it in the spring roll.
USER:   [ACTION-IN-PROGRESS]
USER:   [FINISHED-ACTION] Mhm, what's next?
ROBOT:  [INSTRUCTION] It is time to put some cucumber on
         your spring roll.
USER:   [LOOKS-AT-INGREDIENT]
USER:   [LOOKS-AT-ROBOT] But I just.. again?
USER:   [LOOKS-AT-TIMER]
USER:   [ACTION-IN-PROGRESS]
USER:   [FINISHED-ACTION] Okay I did it, what's next?
```

Results





- **More gaze toward robot, but also more in case of failure**
- **Decrease in acknowledgements after failure**

MULTI-PARTY GROUNDING

Multiparty Cases

- **Dyadic Exchanges within a larger group**
- **Multiple Addressees**
- **Multiple Conversations/floors**
  - Interactions

Participant Roles

- **Conversational Roles**
  - Speaker, hearer,…
- **task roles**
  - authority, responsibility, participant, desire, guard
- **social roles**
  - Status: superior, subordinate, equal, incomparable
  - Closeness: friend, comrade, colleague, acquaintence,stranger, opponent, antagonist
- **activity roles**
  - e.g. courtroom: judge, bailiff, lawyer, witness

Participant Roles (Goffman 74, 81, Clark 96)

- ***Speaker*** **&** ***Hearer*** **are really complex composites**
  - Not individual roles
  - Different kinds of participant status
    - Different rights and responsibilities & actions

Speaker sub-roles

- Roles
  - Composer
  - Performer
  - Responsible Agent
  - Ratified/unratified
- Examples of split roles
  - Author/performer
  - Speechwriter/politician
  - Foreign language speaker/interpreter
  - Copywriter/spokesman/owner

Hearer sub-roles

- **Roles**
  - Addressee (spoken directly to)
  - Side participant (ratified)
  - Bystander (tolerated)
  - Eavesdropper (unknown)
- **Issues: Who**
  - gets Signals from speaker
  - is Speaker aware of
  - does Speaker intend to hear (or intends not to hear)
  - is Message designed for
  - has Obligations to speaker
  - has Right to become speaker
  - gets Attention of participants

Activity-oriented talk (Goffman)

- **Main Activity -ratified speakers & addressees**
  - "Off the record" (among speakers, not meant for ratified listeners)
- **Byplay - ratified addresses & side participants**
  - Borderplay (Brandt) - addressees & other ratified
- **Sideplay - unratified overhearers**
- **Crossplay - ratified & unratified**

Speaker -> Addressee signals

- Vocatives & semantic indications
- Message tailored for understanding
- Body orientation
- Gaze
- Gesture
- Mirroring

Addressee -> Speaker signals

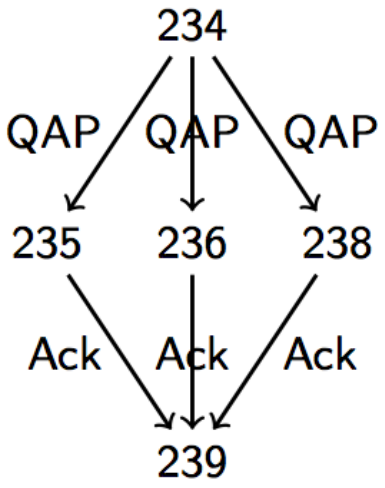
- **Attention**
  - Gaze
  - Posture/orientation
  - mirroring
- **Uptake**
  - Nods, head shakes
  - Facial expressions
  - Eyebrow flashes
- **Turn-taking**
  - Feedback
  - Hands in gesture space
  - gaze

Grounding

- **Two-party**
  - existing models, e.g. Traum 94
  - Signals of understanding from addressee needed for grounding
- **Multi-party**
  - signals from whom? One participant? All?

Settler's of Catan trading dialogue (from Nicholas Asher)

234	gotwood4sheep	anyone got wheat for a sheep?
235	inca	sorry, not me
236	CheshireCatGrin	nope. you seem to have lots of sheep!
237	gotwood4sheep	yup baaa
238	dmm	i think i'd rather hang on to my wheat i'm afraid
239	gotwood4sheep	kk I'll take my chances then...



Issues in Multiparty (multi-conversation) Grounding