

NASSLLI @ USC 2022

Multiparty and Multi-floor dialogue structure

Lecture 3: Multiparty Dialogue Structure

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Outline

- Review
 - Discourse and Dialogue
 - Dialogue Structure & HW Discussion
- Feedback and Grounding
- Multiparty Dialogue
 - Multiparty Dialogue Systems

Discourse Structure Review

- Types of Units
 - Spans
 - Inclusions
 - Relations
 - Hierarchical structure

Adjacency Pairs (Schegloff & Sacks)

- Sequences with features
 - Two utterance length
 - Adjacent
 - Produced by different speakers
 - Typology in production
 - Pair type including First part & second part
 - E.g., Q&A, greeting-greeting, offer-acceptance
- Orientation towards Adjacency Pair
 - Conditional relevance
 - Preferred & dispreferred 2nd parts
 - Hesitations, apologies & qualifications
 - Repairs and apologies

Non-sentential Utterances (Fernandez & Ginzburg 2002)

- Types and Decision Trees
- All involve relations to previous utterances (or dialogue or interactional state)?

NSU Class	Example
Acknowledgment	<i>Mm mm.</i>
Short Answer	<i>Ballet shoes.</i>
Affirmative Answer	<i>Yes.</i>
Clarification Ellipsis	<i>John?</i>
Repeated Ack.	<i>His boss, right.</i>
Rejection	<i>No.</i>
Factual Modifier	<i>Brilliant!</i>
Repeated Aff. Ans.	<i>Very far, yes.</i>
Helpful Rejection	<i>No, my aunt.</i>
Check Question	<i>Okay?</i>
Filler	<i>... a cough.</i>
Bare Mod. Phrase	<i>On the desk.</i>
Sluice	<i>When?</i>
Prop. Modifier	<i>Probably.</i>
Conjunction Phrase	<i>Or a mirror.</i>

Nouri & Traum, Nazarian et al

Initiative coding scheme

Initiative -taking

- **Impose Discourse Obligation (I)**
 - Requires a response from the other party (i.e. proposals and questions)
 - *Example:* “Can you listen to us and let us help you to hire interns?”
- **New Material (N)**
 - New and optional information beyond merely fulfilling a discourse obligation
 - *Example:* “I respect you very much. You have worked for seventeen [years] in this company. I am only a new-comer...”

Responding

- **Fulfill discourse obligation (F)**
 - Fulfills the social obligation imposed by partner’s preceding utterance
 - *Example:* “Um, no. There are problems in your administrative system.”
- **Reference to Previous Utterance (R)**
 - Related to something previously mentioned in the dialog by either party
 - *Example:* “You offered to let us participate in your hiring program, correct?”

Example Annotations

Amani domain



<i>Speaker</i>	<i>Code</i>	<i>Utterance</i>
B	N I R	Amani, do you know anything about a man with a gun?
Amani	I R	You were not clear in what you said. Say it again.
B	I R F	Do you know anything about a sniper?
Amani	R F	There is a group of Al-Qaeda supporters that reside a couple of houses from Assad's shop.

Bennet Stokes domain



<i>Speaker</i>	<i>Code</i>	<i>Utterance</i>
Bennet	N I R	Ok, you have hired two interns. But let's talk about the future. Can you listen to us and let us help you hire interns?
Stokes	I R	I can't understand why you have to help me to hire interns.
Bennet	R F	Because this project is held by me. I have to choose people. You know, because I am in Personnel Department.
Stokes	R	But you...
Bennet	N R	All the people here in the company are hired through me, including you.

Twins domain



<i>Speaker</i>	<i>Code</i>	<i>Utterance</i>
Visitor	N I	What do you do for a living?
Ada	R F	We text, tweet, blog...
Grace	N I R	Whoa! You might want to answer in English, Ada.
Ada	R F	Oh, we like to use the web to keep in touch with friends.
Visitor	N I	What is a virtual human?
Grace	R F	A virtual human looks and acts like a human, but isn't really alive.
Ada	N R	That's just a clever way of saying we're a lot like you, just on this side of the screen.

Annotation Exercise:

Apply Nouri & Traum Initiative Coding Scheme to the following dialogues

Task-oriented

1. usr: Can I get tickets for zoolander 2 tomorrow?
2. agt: Which city would you like?
3. usr: I want to watch at seattle.
4. agt: How many tickets do you need?
5. usr: I want 2 tickets please!
6. agt: 9:25 pm is available.
7. usr: I want to watch at regal meridian 16.
8. agt: Great - I was able to purchase 2 tickets for you to see zoolander 2 tomorrow at regal meridian 16 theater in seattle at 9:25 pm.
9. usr: Thank you.
10. agt: Thank you.

Chat

1. *User:* hello
2. *System:* i do. i watch it sometimes. do you like to listen to music?
3. *User:* i like classic rock
4. *System:* i do. rock music also drew strongly on a number of other genres such as electric blues and folk
5. *User:* what is your favorite kind of music?
6. *System:* i like pop music. do you like any other genre of music?
7. *User:* classical symphonies
8. *System:* i like classic rock. did you know paul mccartney of the beatles composes classical
9. *User:* tell me about yourself
10. *System:* i am a musician. do you like to play instruments?
11. *User:* no what do you play?
12. *System:* i have a guitar. what about you?
13. *User:* i don't play any instruments
14. *System:* i don't play either. i play a piano. what about you?
15. *User:* i told you already. But what do you play?
16. *System:* i play the piano. i don't play it very well. i don't think it
17. *User:* do you play guitar?
18. *System:* i do. i play the guitar. i don't play it very well. i do n
19. *User:* where are you from?
20. *System:* i am from new york, new york city. how about you?
21. *User:* los angeles
22. *System:* ya, that's pretty cool. did you hear about the celeb burglaries? they say 4
23. *User:* 4?
24. *System:* ya, the celeb burglaries are like when someone steals your car, what do you do?
25. *User:* huh?
26. *System:* yeah, do you listen to music much? i do not. i listen to podcasts sometimes, do
27. *User:* do you play any instruments?
28. *System:* i don't, but i do like to play guitar. do you play?
29. *User:* where did you say you are from?
30. *System:* I live in california, and i live in the bay area. how about you?

Common Ground and Grounding

- For more see ESSLLI 2022 Course
- <https://people.ict.usc.edu/~traum/ESSLLI2022>



ESSLLI
2022

HOME REGISTRATION ▾ ABOUT ESSLLI ▾ COURSES & WORKSHOPS ▾ LOCATION ▾ PEOPLE

CODE OF CONDUCT

**33RD EUROPEAN SUMMER SCHOOL IN
LOGIC, LANGUAGE AND INFORMATION**

8-19 August, 2022
National University of Ireland Galway

Types of Feedback (Allwood et al 92)

- Levels:

- Contact
- Perception
- Understanding
- Attitudinal Reaction

- Signals types

- Request feedback
- Prepare other
- Provide
 - Positive
 - negative

Requesting Feedback



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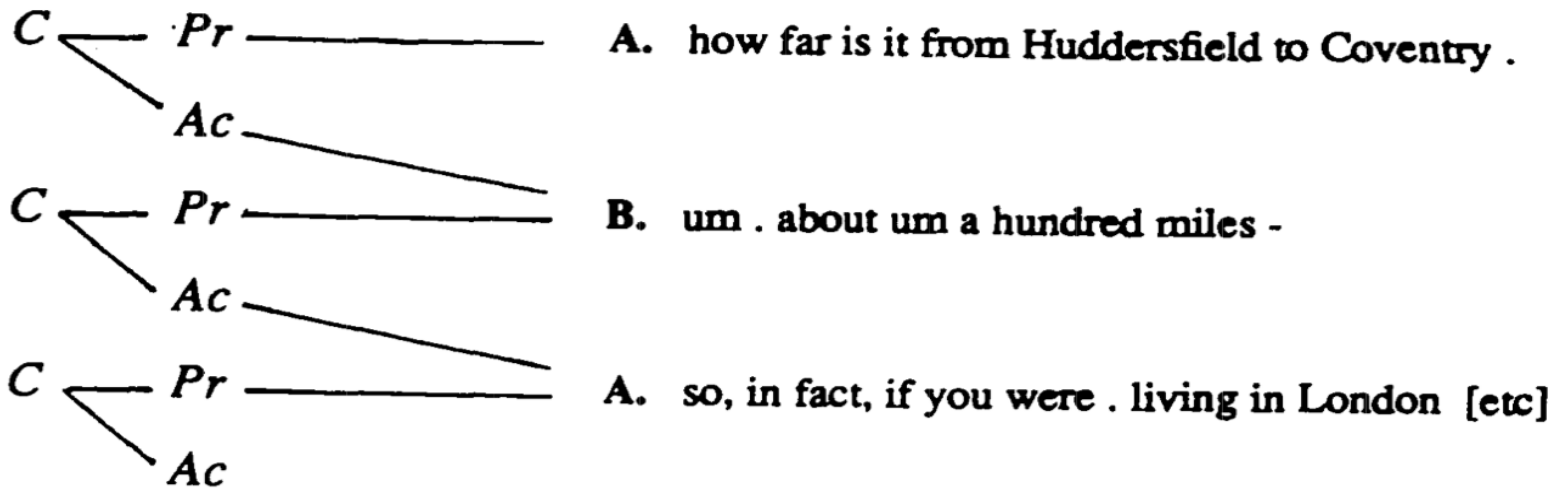
Some Styles of Verbal Response

- 1 **Sys:** Where do you want to go?
- 2 **User:** Boston.
- 3a **Sys:** When would you like to go?
- 3b Tell me more about your travel plans.
- 3c When would you like to go to Boston?
- 3d Do you want to go to Boston?
- 3e Did you say Boston?
- 3f Boston?
- 3g Boston or Austin?
- 3h Where?
- 3i Please Repeat.

Clark & Schaefer's contribution model

- Contributions to dialogue are collaborative achievements composed of two phases:
 - **Presentation Phase:** **A** presents utterance **u** for **B** to consider. He does so on the assumption that, if **B** gives evidence **e** or stronger, he can believe that **B** understands what **A** means by **u**
 - **Acceptance Phase:** **B** accepts utterance **u** by giving evidence **e'** that he believes he understands what **A** means by **u**. He does so on the assumption that, once **A** registers evidence **e'**, he will also believe that **B** understands.

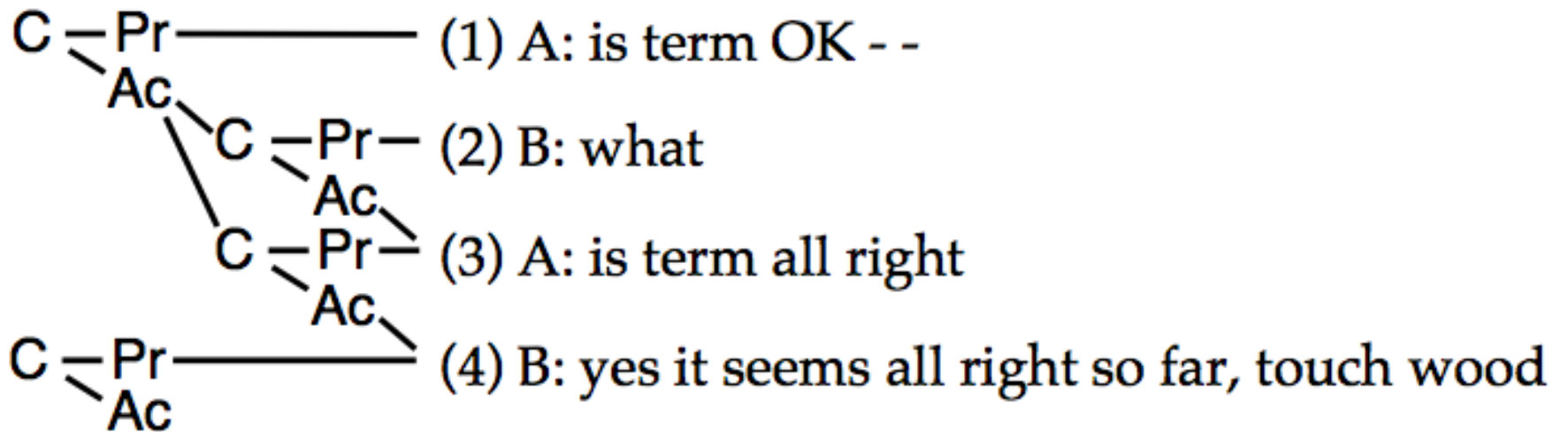
Serial Contribution Graphs



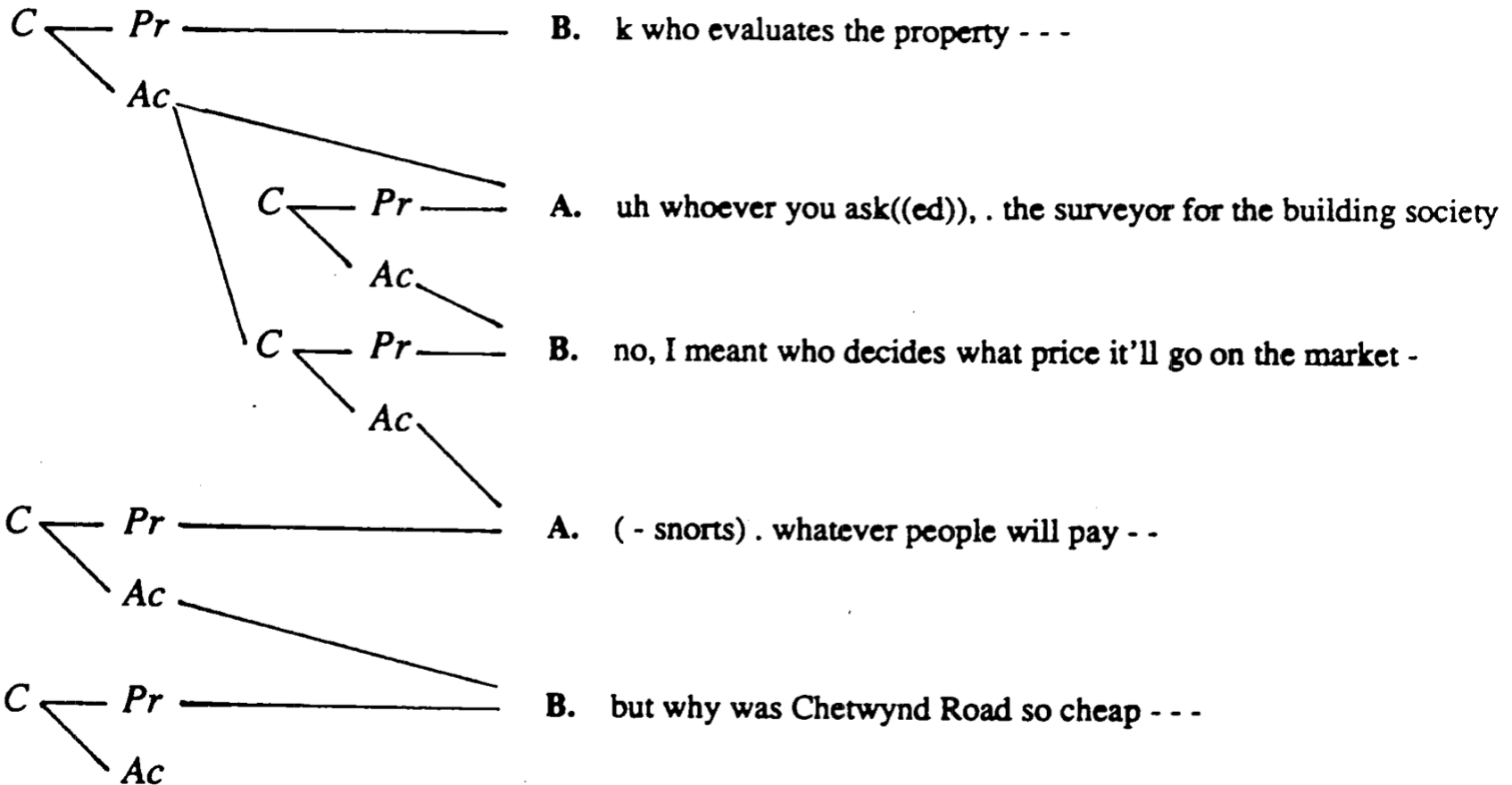
Contribution Model

- Each signal is also a presentation to be grounded
 - Recursive model
- **Grounding Criterion:** “The contributor and the partners mutually believe that the partners have understood what the contributor meant to a criterion sufficient for the current purpose”
- **Graded Evidence:**
 - Display
 - Demonstration
 - Acknowledgement
 - Initiation of next relevant contribution
 - Continued attention

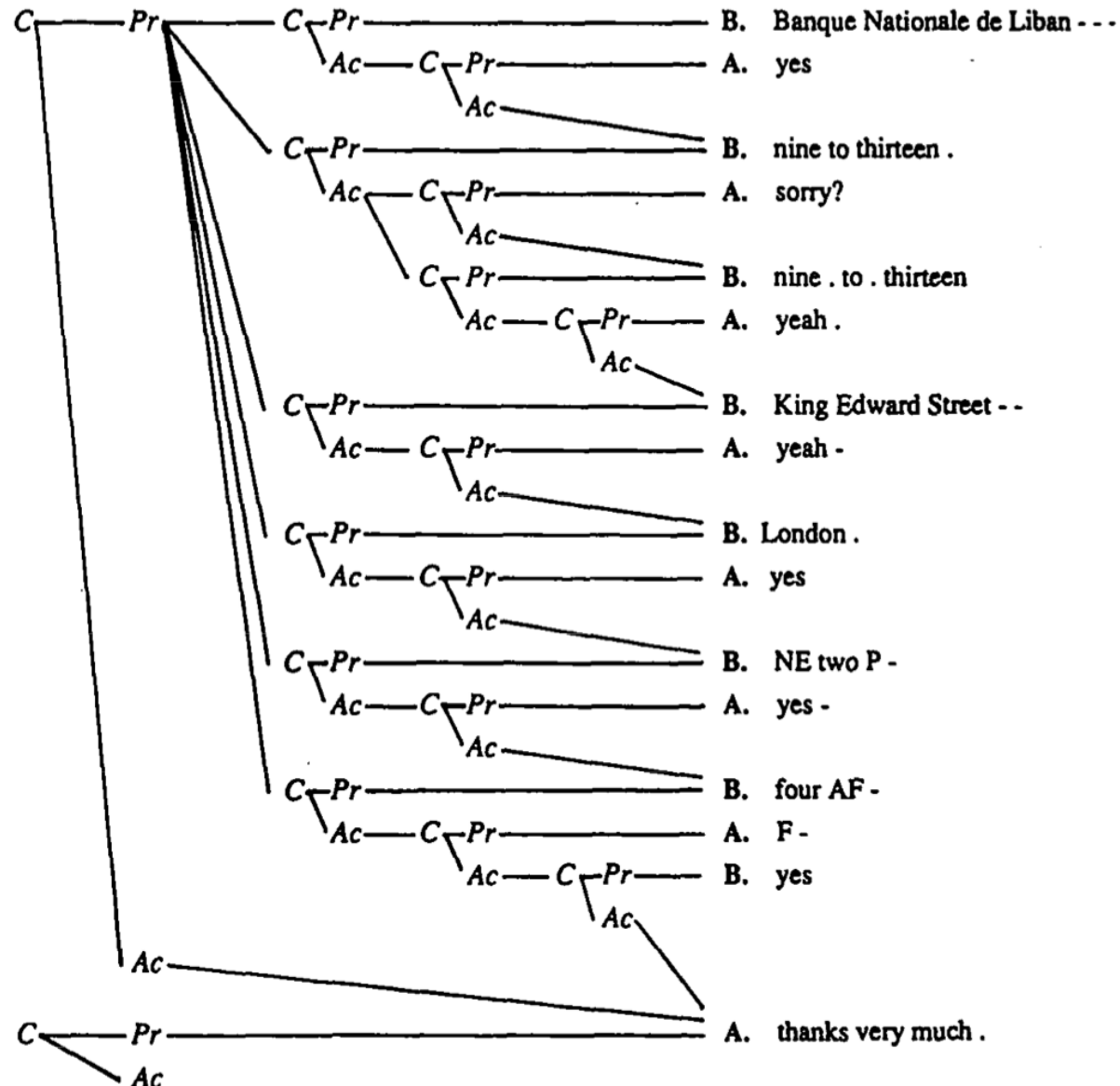
Example of Contribution model – embedded repair request



Contributions with embedded repairs



Contribution with installments



Deficiencies of Contribution Model

- Off-line model
 - No way to tell recursion has finished until after the fact
 - No clear specification of moves (for interpretation & generation)
 - Not predictive of next utterances
- Issues with types of evidence

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 Acts

Label	Description
initiate	Begin new DU, content separate from previous uncompleted DUs
continue	same agent adds related content to open DU
acknowledge	Demonstrate or claim understanding of previous material by other agent
repair	Correct (potential) misunderstanding of DU content
Request Repair	Signal lack of understanding
Request Ack	Signal for other to acknowledge
cancel	Stop work on DU, leaving it ungrounded and ungroundable

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	Ack ^{I,R}	Initiate ^{I,R} (next DU)
D	Cancel ^{I,R}	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	

Grounding Example: Trains Domain

(1) 1 I: Move the boxcar to Corning
2 I: and load it with oranges
3 R: ok

(2) 1 I: Move the boxcar to Corning
2 R: ok
3 I: and load it with oranges
4 R: ok

(3) **utt: Grounding Act DU1**
1: $\text{init}^I(1)$ 1
2: $\text{cont}^I(1)$ 1
3: $\text{ack}^R(1)$ F

(4) **utt: Grounding Act DU1 DU2**
1: $\text{init}^I(1)$ 1
2: $\text{ack}^R(1)$ F
3: $\text{init}^I(2)$ F 1
4: $\text{ack}^R(2)$ F F

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

Basic Terms

- Discourse – coherent extended interaction (more than a single sentence)
- Dialogue – coherent interaction between multiple participants
- **Multiparty Dialogue – dialogue between more than two participants**
- **Multi-floor Dialogue**

Example Multi-party Dialogue

A It's a nice day today

B Is it?

A No rain in sight.

A And a pleasant temperature.

B But we are in a drought!

C I guess too many nice days is not so nice.

Multiparty Interactions

UTEP-ICT Corpus (Herrera et al 2010)



AMI Corpus data collection

<https://groups.inf.ed.ac.uk/ami/corpus/>



Multiparty Dialogue Systems

Background Characters (Jan et al 2007): Culture-specific group conversation

Arab cultural parameters



American cultural parameters



Culture-specific parameters

Arabic.culture
Mexican.culture
North American.culture

Speaker	Looking At Addressee		Away	Addressee	Listener
	Attending	NonAttending			
Speaker				<input type="text" value="14.0"/>	<input type="text" value="14.0"/>
Addressee	<input type="text" value="6.0"/>	<input type="text" value="1.0"/>			<input type="text" value="2.0"/>
Random	<input type="text" value="2.0"/>	<input type="text" value="8.0"/>	<input type="text" value="9.0"/>	<input type="text" value="1.0"/>	<input type="text" value="1.0"/>
Away	<input type="text" value="2.0"/>	<input type="text" value="1.0"/>	<input type="text" value="1.0"/>	<input type="text" value="1.0"/>	<input type="text" value="1.0"/>

Gazing at me factor

Arabic.culture

Proxemics
Gaze
Silence

Personality
Culture
Relationships
Scene

Intimate Zone	<input type="text" value="0.45"/>
Personal Zone	<input type="text" value="0.7"/>
Social Zone	<input type="text" value="1.5"/>

Arabic.culture

Niki and Julie Art Ranking Task (Artstein et al 2018)



Virtual Museum Guides (Twins)

<https://www.youtube.com/watch?v=S8t4idjLQNI&list=PLBF277FAE78E8CB39&index=16>



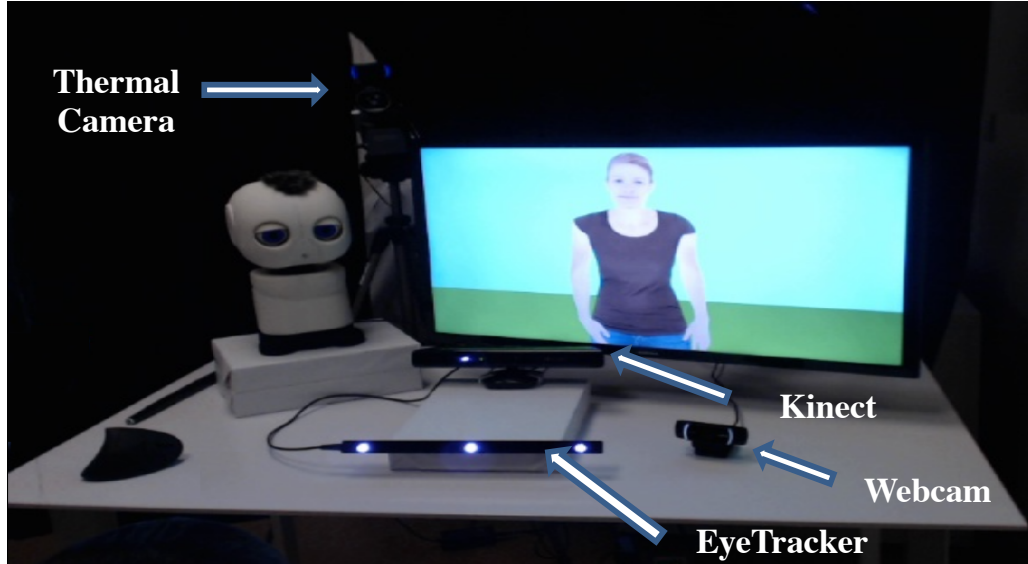
Gunslinger: Rio (With Cara Santa Maria, Huffington Post 2012)



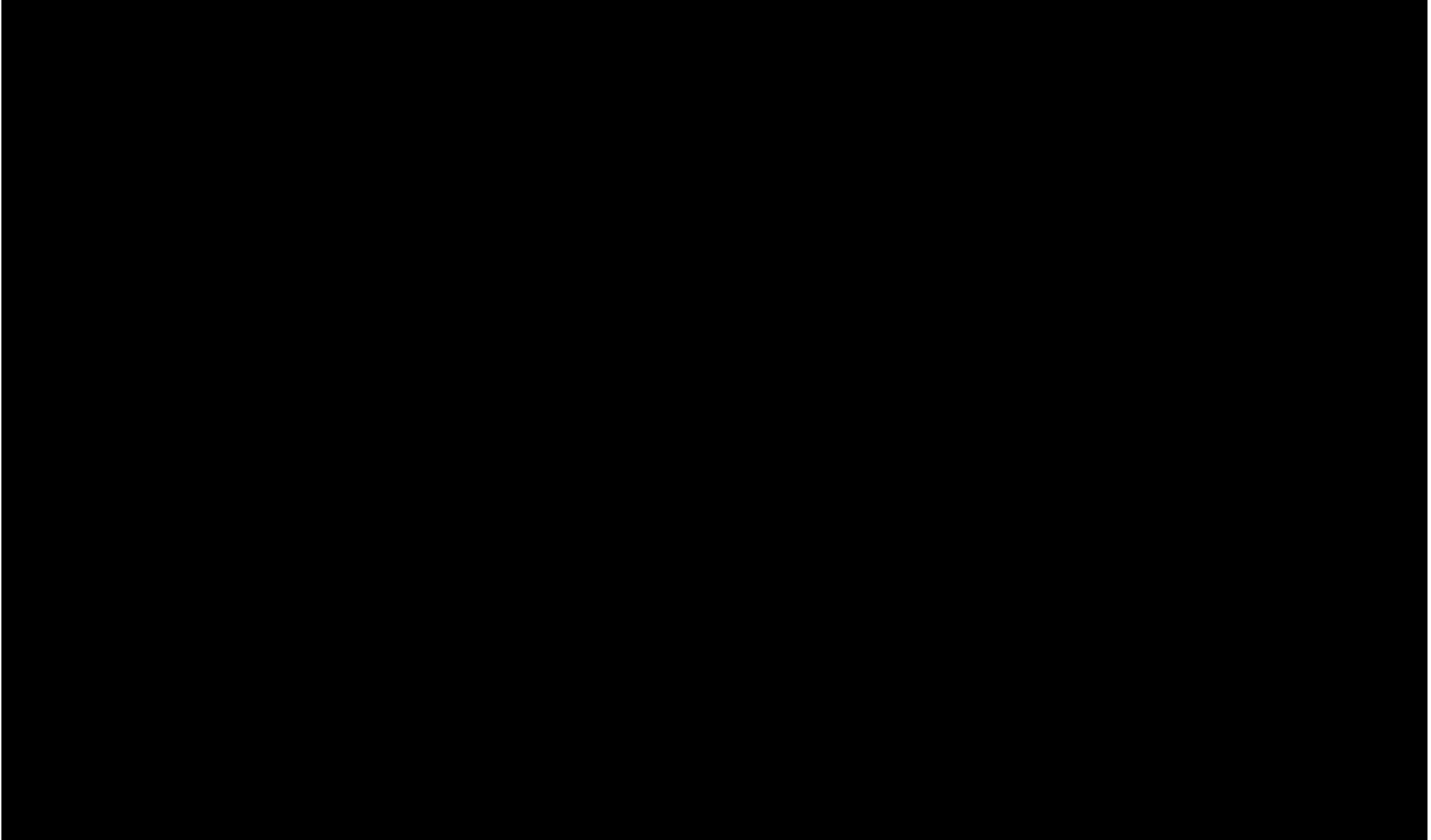
Robot Avatar thermal-Enhanced (RAVE) Learning tool

Scassalati et al CHI 2018, Gilani et al ICMI 2018, Gilani et al IVA 2019

- Providing visual language stimulus in contingent interaction, during critical learning period



Rave Interaction with Baby



Furhat Robotics

<https://www.youtube.com/watch?v=0tDTpF3mINA>



Shen et al 2018 Robot Conflict Mediator

<https://www.youtube.com/watch?v=2TYjzIUUnRjA>



Virtual Human Negotiation:

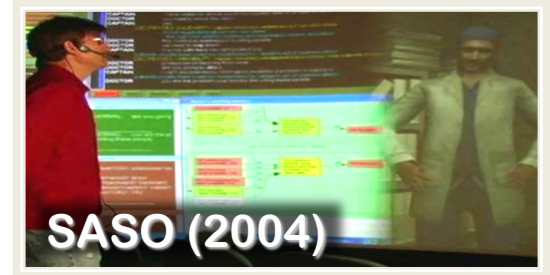
Capability-advancing prototypes



Decision-making



Multi-party Interaction



Non-cooperative
Negotiation



Multi-party negotiation



Persuasion and Conflict resolution

ICT Mission Rehearsal Exercise (MRE) Project



- **VR Theatre**

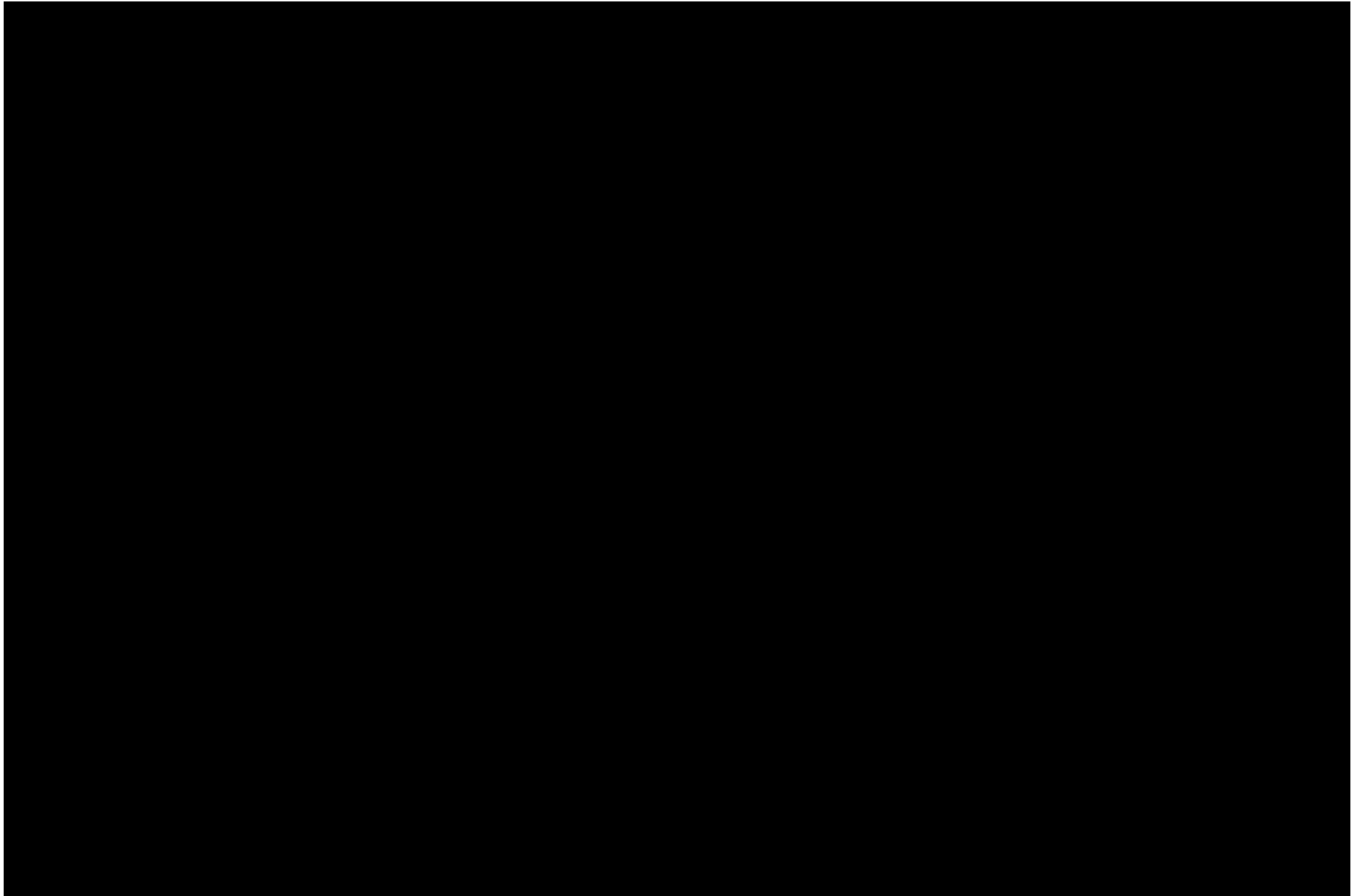
- 8' 150° Curved Screen,
- Multiple Projectors
- 10-2 3-d spatialized sound

- **Bosnia Peacekeeping Scenario**

(Swartout et al '01)

- **Human lieutenant (student) faces peacekeeping dilemmas**
- **Artificial agents interact with user**
 - Mentor (e.g., sergeant, front left)
 - Teammates (e.g., medic, front right)
 - Locals (e.g., mother, front center)

Mission Rehearsal Exercise (MRE)



Aspects of MRE Dialogue

- Multimodal:
 - Face To Face (speech+gesture), [Radio](#)
 - Speaking modes (shouting, normal, [whispering](#))
- Interleaved communication and action
 - Communication to support action (orders, negotiation)
 - Actions to support communication (contact, turn-taking)
 - Actions as communication (acting on an order as grounding order)
- Multiple Interactors
 - Messages tailored for multiple addressees/overhearers
- Multiple Conversations
 - LT With base/other platoon about arrival time, medevac
 - LT With Sgt, Medic about local area/platoon orders
 - SGT with troops to carry out orders

SASO-EN: 3-party Negotiation

https://www.youtube.com/watch?v=oOp4XP_ziMw

