

# NASSLLI @ USC 2022

## Multiparty and Multi-floor dialogue structure

### Lecture 3.3: Multiparty Dialogue Structure & Introduction to Multifloor Dialogue

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# Outline

- Multiparty Dialogue Structures
  - Generalizing Participant Roles
  - Signaling and Recognizing Roles
  - Multiple conversations & threads
  - Turn-taking
  - Initiative
  - Obligations
  - Grounding
- Introduction to Multifloor Dialogue

# Annotation Exercise:

Chat

Apply Nakatani & Traum CGU 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.

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

# Multiparty Dialogue Structure

# Participant Roles

- Conversational Roles
  - Speaker, hearer,...
- task roles
  - authority, responsibility, participant, desire, guard
- social roles
  - Status: superior, subordinate, equal, incomparable
  - Closeness: friend, comrade, colleague, acquaintance, 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

- Main Activity -ratified speakers & addressees
  - Offline (among speakers, not meant for ratified listeners)
- Byplay - ratified addressees & side participants
  - Borderplay (Brandt) - addressees & other ratified
- Sideplay - unratedified overhearers
- Crossplay - ratified & unratedified

# Example of non-ratified speaker and Byplay/crossplay

- <https://youtu.be/BbBeW70dH-I>

# Speaker -> Addressee signals

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

# Addressee -> Speaker signals

- Attention (ratification)

- Gaze
- Posture/orientation
- mirroring

- Uptake

- Nods, head shakes
- Facial expressions
- Eyebrow flashes

- Turn-taking

- Feedback
- Hands in gesture space
- gaze

# Change in Participant Status

- Turn-taking

- Addressee -> speaker
  - Speaker selection
  - Self-selection
- Other -> speaker
- Speaker -> addressee (or other)

- Addressee -> other

- Speaker addressee shift
- Addressee attention shift

- Other -> addressee

- Addressee-like behavior
  - Attention, grounding
- Speaker inclusion

# Speaker ID

- Two Party:
  - If not me, then you
- Multi-party:
  - Audio
    - Acoustic features
    - Self ID
    - Style features/content
  - Multi-modal
    - Stereo localization
    - Visual identification (lips moving, gesturing)

# Addressee Identification

- Two-party:
  - Non-speaker
- Multi-party
  - Speech/Text
    - Vocatives
    - Content
    - Context
  - Multimodal
    - Gaze
    - Orientation
    - gesture



# MRE Multi-party (speech or text) Addressee Identification: Algorithm

1. If utterance specifies addressee
  - Vocative
  - not expecting short answer or clarification of person type

⇒ Addressee = specified addressee
2. Else If current utterance speaker is same as previous utterance speaker
  - ⇒ Addressee = previous addressee
3. Else If previous speaker  $\neq$  current speaker
  - ⇒ Addressee = previous speaker
4. Else if (active) conversational participant in same conversation
  - ⇒ Addressee = participant
5. Else ?

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# MRE Multi-party (speech or text) Addressee Identification: Algorithm

1. If utterance specifies addressee
  - Vocative
  - not expecting short answer or clarification of person type

⇒ Addressee = specified addressee
2. **else if speaker facing someone**

⇒ **Addressee = faced participant**
3. Else If current utterance speaker is same as previous utterance speaker

⇒ Addressee = previous addressee
4. Else If previous speaker  $\neq$  current speaker

⇒ Addressee = previous speaker
5. Else if (active) conversational participant in same conversation

⇒ Addressee = participant
6. Else ?

# Ex: Use of visual Orientation for Addressee Recognition

- Without Vision
  - Use explicit naming
  - Use context of previous speaker/addressee
  - Can't tell sometimes
- Example video
- With Vision
  - Use gaze/orientation to disambiguate addressee



# Modified Addressee Recognition from op den Akker & Traum

```
(1) (address term used)
if (containsAddressTerm(DA)) {
    return referredPerson;}

(2) (same speaker turn)
if (daSpeaker=prevDASpeaker) {
    if (gazeAddress=previousADR ) {
        return previousADR;
    } else{
        return "G";}}
```

```
(3) (other speaker)
if (daSpeaker=previousADR)
    return prevDASpeaker;
if (gazeAddress!=null && you)
    return foa;
if (gazeAddress=prevDASpeaker) {
    return prevDASpeaker;}}
```

# Turn-taking

- Model:
  - Cues (basic physical performances)
  - Signals (cluster of one or more cues indicating intent regarding turn)
  - acts (turn-taking results, given context of all participants actions)
- Two-party
  - Take-turn, hold-turn, release-turn
- Multi-party
  - Assign-turn, request-turn
  - Management across channels
  - Management across conversations

# Multi-threading

- Two-Party
  - Topic-shifts
- Multi-party
  - Multiple active threads
  - Separate conversations
  - Parallel conversations
    - Dependency
    - influence
  - Dynamic starting, ending, splitting, merging, entry, exit

# AMI Corpus – topic segmentation

The screenshot displays the ICSI Topic Segmenter application window, which is divided into several panels:

- Topic Panel:** Contains input fields for 'Start', 'End', and 'Description', each with a corresponding 'show' or 'edit' button. The 'Start' field contains the text "so that 's [disfmarker] OK , so that 's [disfmarker]", the 'End' field contains "see if David could make it . That would be good .", and the 'Description' field contains "scheduling next meeting".
- NITE Audio player:** Features a progress bar and three green play buttons. It includes checkboxes for 'Synchronise' (checked) and 'Mute' (unchecked).
- Transcription Display:** Shows a list of transcription lines with speaker identifiers and timestamps. The visible lines are:
  - 164 mn048: [vocalsound: laugh] [vocalsound: laugh]
  - 165 mn047: Yeah [vocalsound: laugh] Yeah [vocalsound: laugh]
  - 166 me010: Great . Great .
  - 167 me010: OK , so that 's [disfmarker] OK , so that 's [disfmarker]
  - 168 me010: Sort of one branch is to get us caught up on what 's going on . Sort of one branch is to get us caught up on what 's going on .
  - 169 me010: Also of course it would be really nice to know what the plans are , in addition to what 's sort of already in code . Also of course it would be really nice to know what the plans are , in addition to what 's sort of already in code .
  - 170 mn048: Yes . Yes .
  - 171 me010: and
  - 172 me010: we can d I dunno w w was there
  - 173 me010: uh a time when we were set up to do that ?
  - 174 me010: It probably will work better if we do it later in the week , after [pause] we actually understand
  - 175 mn048: Yes .
  - 176 mn047: Hmm .
  - 177 mn048: Yeah .
  - 178 me010: uh better what 's going on .
  - 179 me010: So when do you guys leave ?
  - 180 mn048: Um we 're here through Sunday , so [pause] [comment: creaky voice]
  - 181 mn047: Oh
  - 182 me010: Oh , OK , so [disfmarker]
  - 183 mn048: All through Friday would be fine .
  - 184 me010: OK , So [disfmarker]
  - 185 me010: so anyt we 'll find a time later in the week to uh get together and talk about [pause] your understanding of what SmartKom plans are .
  - 186 mn048: Mm - hmm .
  - 187 me010: and how we can change them .
  - 188 mn047: [vocalsound: laugh]
  - 189 mn048: Yes . Sure .
- Controls Panel:** Includes buttons for 'delete topic', 'add super-topic', and 'find first uncoded element'.
- Topics Panel:** A hierarchical tree view of topics. The selected topic is 'topic: scheduling next meeting', which is further divided into sub-topics: 'Start - 167 me010: OK , so that 's [disfmarker] OK , s', 'topic: when', and 'topic: who'. The 'End' time for this topic is '240 me010: OK well yeah maybe we 'll see if D'.



# Ginzburg & Fernandez 2005: Scaling up

- Non-sentential utterances in Dialogue and multilogue

NSU Class	Example	Total	Distance							
			1	2	3	4	5	6	>6	
Acknowledgment	<i>Mm mm.</i>	595	578	15	2					
Short Answer	<i>Ballet shoes.</i>	188	104	21	17	5	5	8	28	
Affirmative Answer	<i>Yes.</i>	109	104	4			1			
Clarification Ellipsis	<i>John?</i>	92	76	13	2	1				
Repeated Ack.	<i>His boss, right.</i>	86	81	2	3					
Rejection	<i>No.</i>	50	49	1						
Factual Modifier	<i>Brilliant!</i>	27	23	2	1	1				
Repeated Aff. Ans.	<i>Very far, yes.</i>	26	25	1						
Helpful Rejection	<i>No, my aunt.</i>	24	18	5		1				
Check Question	<i>Okay?</i>	22	15	7						
Filler	<i>... a cough.</i>	18	16	1		1				
Bare Mod. Phrase	<i>On the desk.</i>	16	11	4				1		
Sluice	<i>When?</i>	11	10	1						
Prop. Modifier	<i>Probably.</i>	11	10	1						
Conjunction Phrase	<i>Or a mirror.</i>	10	5	4	1					
<b>Total</b>		1285	1125	82	26	9	7	8	28	
<b>Percentage</b>		100	87.6	6.3	2	0.6	0.5	0.6	2.1	

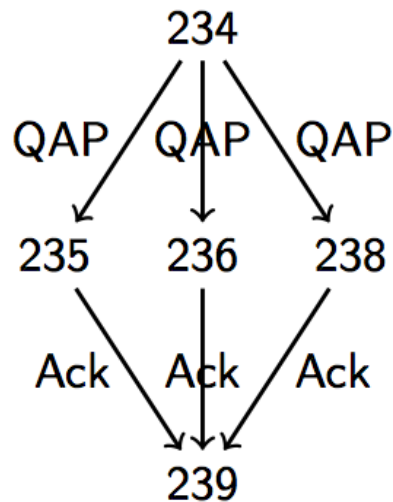
Table 2: NSUs sorted by Class and Distance

Distance	1	2	3	4	5	6	>6
Dialogue	658 (59%)	37 (45%)	11 (45%)	1 (12%)	1 (14%)	1 (13%)	0 (0%)
Multilogue	467 (41%)	45 (55%)	15 (55%)	8 (88%)	6 (86%)	7 (87%)	28 (100%)

Table 3: NSUs in dialogue and multilogue sorted by distance

# STAC Corpus: Settler's of Catan trading dialogue (Asher et al 2016)

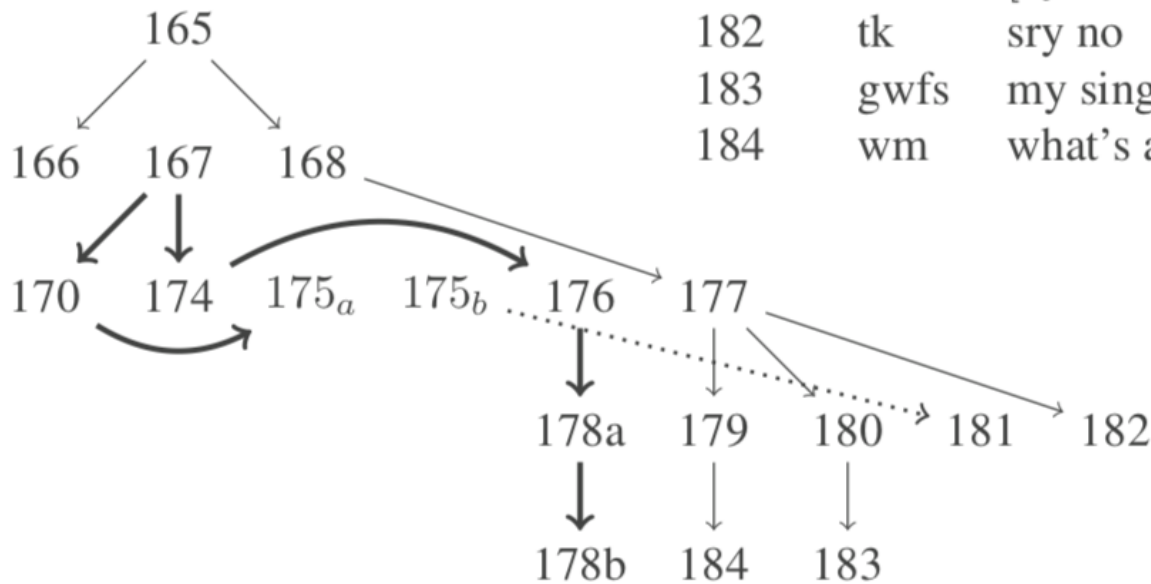
234 gotwood4sheep anyone got wheat for a sheep ?  
235 inca sorry, not me  
236 CheshireCatGrin nope. you seem to have lots of sheep !  
237 gotwood4sheep yup baaa  
238 dmm i think i'd rather hang on to my wheat i'm afraid  
239 gotwood4sheep kk I'll take my chances then...



# Multiple Threads

## EXAMPLE 1

165	lj	anyone want sheep for clay?
166	gwfs	got none, sorry :(
167	gwfs	<b>so how do people know about the league?</b>
168	wm	no
p 170	lj	<b>i did the trials</b>
174	tk	<b>i know about it from my gf</b>
175	gwfs	[ <b>yeah me too,</b> ] <sub>a</sub> [are you an Informatics student then, lj?] <sub>b</sub>
176	tk	<b>did not do the trials</b>
177	wm	has anyone got wood for me?
178	gwfs	[ <b>I did them</b> ] <sub>a</sub> [ <b>because a friend did</b> ] <sub>b</sub>
179	gwfs	lol wm, you cad
180	gwfs	afraid not :(
181	lj	[no, I'm about to start math.] <sub>a</sub> [I just hang around appleton a lot] <sub>b</sub>
182	tk	sry no
183	gwfs	my single wood is precious
184	wm	what's a cad?



# Conversation/thread Identification

- Two-party
  - Single conversation
  - Topic coherence
- Multi-party
  - Channel/conversation relationship
  - Addressee/conversation relationship
  - Topic/conversation relationship

# Initiative

- Two-party
  - System, user, mixed
- Multi-party
  - Asymmetric
  - Cross-initiative
    - Address different participant
    - Different participant interjects
  - Cross-conversation initiative
- Ishizaki & Kato 1998 – initiative-taking behavior more clearly observed in 2-party than three

# Addressee Obligations

- Two-party
  - Addressee has obligation to act
- Multi-party
  - Obligations from multi-addressee?
    - Indefinite obligation (group obligation)?
    - Distributed obligation to all?
    - No obligation (option)?

# Grounding

- Two-party
  - existing models, e.g. Traum&Allen 92
  - Signals of understanding from addressee needed for grounding
- Multi-party
  - signals from whom? One participant? All?

# Novick, Walton & Ward '96: Contribution Graphs in Multiparty Discourse

- Assumptions:

1. speaker need not ensure that non-addressees understand the presentation
2. a hearer may believe that she is an addressee even if she is not addressed directly by the speaker
3. hearer, even when she believes that she is an addressee, may present less-than-normally strong evidence of understanding if (a) other addressees present normally strong evidence and (b) the hearer believes the other addressees' understanding is sufficiently mutual.



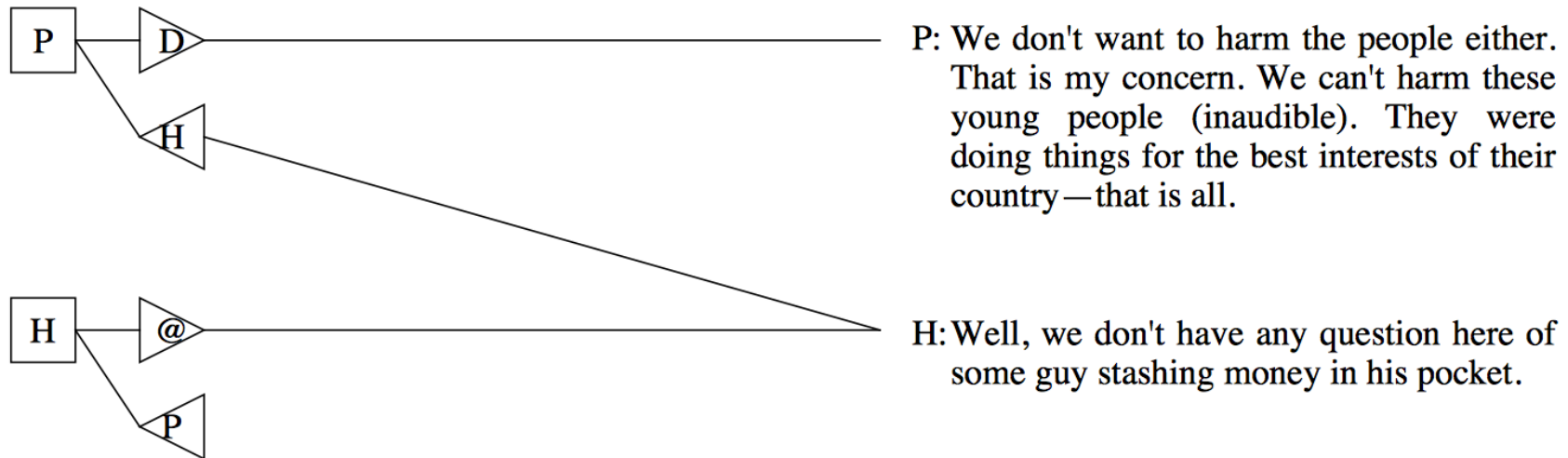
# Novick, Walton & Ward '96:

- Contribution: is an action by a speaker that has content intended to be conveyed to at least one hearer and that assists some subset of the conversants in establishing mutual belief.
- Primary Evidence is evidence  $e'$  presented by hearer  $B_i$  where she believes that she was an intended addressee of A's. That is,  $B_i$  believes that A requires evidence from her to believe that they mutually understand  $u$ .
- Secondary Evidence is evidence  $e'$  presented by hearer  $B_i$  when she believes that she was not an intended addressee of A's and/or she believes that A does not require primary evidence of understanding.

# Novick, Walton & Ward '96:

- Presentation Phase
  - A presents utterance  $u$  for some subset of  $B_1, \dots, B_n$  to consider based on the assumption that if that same subset of hearers collectively gives enough primary evidence  $e$ , he can believe that they understand what he meant by  $u$ .
- Acceptance Phase
  - For all hearers  $1 \leq i \leq n$ ,  $B_i$  accepts utterance  $u$  by giving either primary or secondary evidence that she understands what A means by  $u$ . She does so on the assumption that if A registers the evidence, he will believe that A understands.

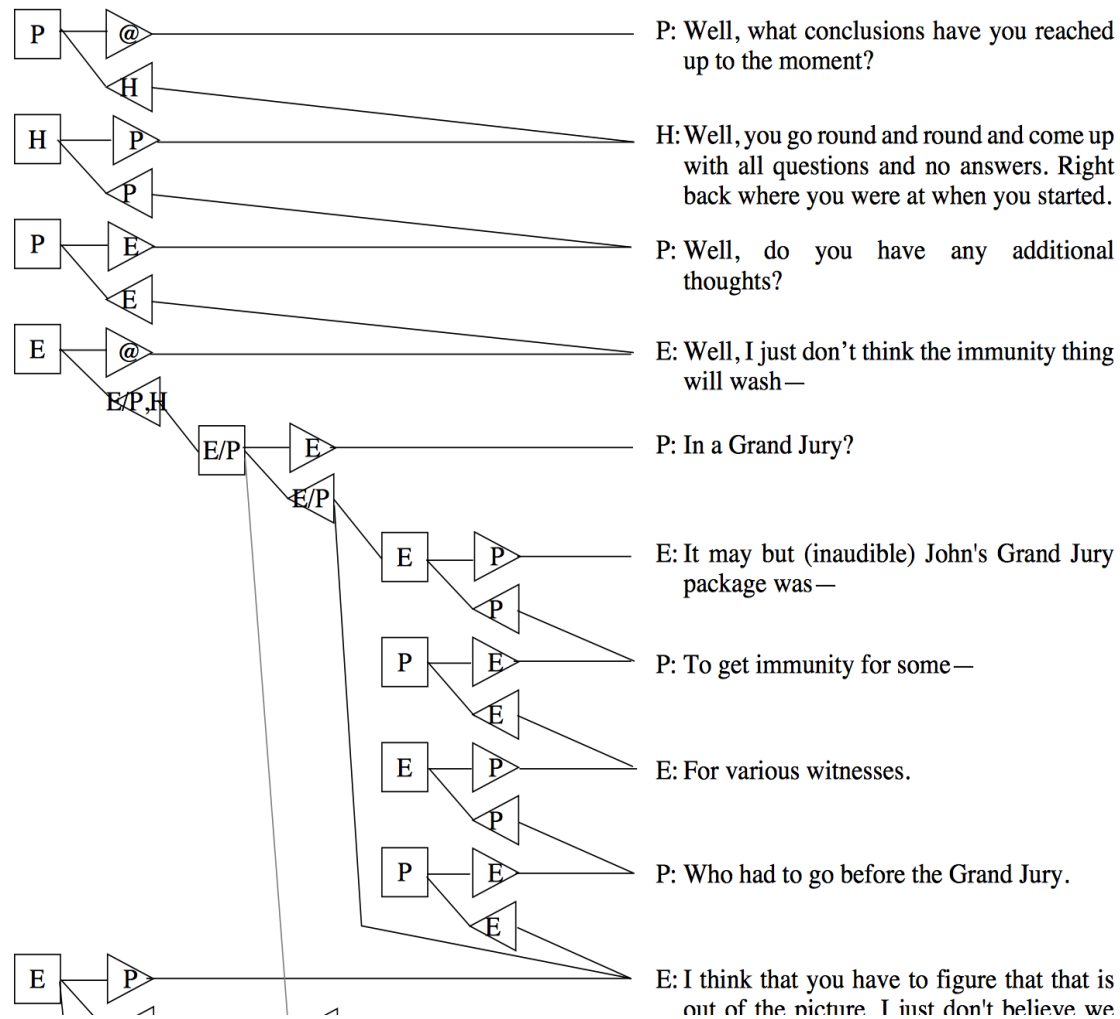
# Novick, Walton & Ward '96:



**Figure A1. Basic Annotations.**

The first utterance is a single contribution by the President, as indicated by the letter P in the first contribution symbol. This contribution is directed toward Dean, as indicated by the letter D in the right-facing triangle which follows the contribution box. This contribution is acknowledged by Haldeman, who responds with a relevant next contribution. Although Haldeman's contribution acknowledges the President's contribution, it is directed toward the entire group; this is indicated by the @ in presentation symbol.

# Novick, Walton & Ward '96: Example



# MRE (Austin) Multi-party grounding model

- Implemented:
  - Multiparty conversation, single addressee
  - Components:
    - State
    - Initiator
    - Responder
    - Contents
- Multi-addressee
  - Any addressee acknowledgement grounds
  - Split into multiple single speaker-addressee units
- Cross-grounding

# Common Ground and Grounding

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

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# Summary

- Multiparty dialogue adds new issues
  - Added complexities to two-party issues
  - New problems
- Multiparty also offers new opportunities
  - Insight to interplay of functions, some of which might be latent in two-party interaction
- More work needed!

# Homework: Multiparty Dialogue

- Apply the IU and CGU coding from Nakatani & Traum 1998 to the settler's of cataan dialgue

## EXAMPLE 1

165 lj anyone want sheep for clay?  
166 gwfs got none, sorry :(  
167 gwfs **so how do people know about the league?**  
168 wm no  
p 170 lj **i did the trials**  
174 tk **i know about it from my gf**  
175 gwfs [**yeah me too,**]<sub>a</sub>  
[are you an Informatics student then, lj?]<sub>b</sub>  
176 tk **did not do the trials**  
177 wm has anyone got wood for me?  
178 gwfs [**I did them**]<sub>a</sub> [**because a friend did**]<sub>b</sub>  
179 gwfs lol wm, you cad  
180 gwfs afraid not :(  
181 lj [*no, I'm about to start math.*]<sub>a</sub>  
[*I just hang around appleton a lot*]<sub>b</sub>  
182 tk sry no  
183 gwfs my single wood is precious  
184 wm what's a cad?





# NASSLLI @ USC 2022

## Multiparty and Multi-floor dialogue structure

### Lecture 4: Multifloor Dialogue

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# Channel management

- Two-Party
  - Who speaks when
- Multi-party
  - Which conversation is active
- Modality
  - Cross modality channels
  - Same modality channels

# Ft Rucker Helicopter Mission Simulation

1397	12:00:12	12:00:13	43	P02	DO	dragonops ,
1398	12:00:13	12:00:17	42	R06	R07	+ didn't call for the: uh fifteen+ fifteen minute uh ops normal .
1399	12:00:13	12:00:13	43	P02	DO	<i>predator zero two ,</i>
1400	12:00:15	12:00:15	43	DO-W	P02	<u>predator zero two</u> ?
1401	12:00:15	12:00:16	43	DO-W	P02	<i>this is dragonops .</i>
1402	12:00:16	12:00:16	43	DO-W	P02	over ,/
1403	12:00:17	12:00:17	42	R06	R07	over ,
1404	12:00:17	12:00:19	43	P02	DO	predator zero one and zero two are alpha at this time ,
1405	12:00:18	12:00:19	45	A06	R07	<u>rogue zero seven</u> .
1406	12:00:19	12:00:20	45	A06	R07	<i>anvil zero six ,</i>
1407	12:00:27	12:00:28	43	DO-W	P02	i have you alpha at fourteen hundred .
1408	12:00:28	12:00:29	43	DO-W	P02	over ,
1409	12:00:30	12:00:31	43	P02	DO	<i>predator zero two .</i>
1410	12:00:31	12:00:31	43	P02	DO	roger .
1411	12:00:34	12:00:35	8	R07-A	R07-B	okay:: .
1412	12:00:35	12:00:38	8	R07-A	R07-B	i only see uh / five vehicles .//
1413	12:00:39	12:00:45	8	R07-A	R07-B	confirm with anvil that the only+ his convoy has gone from sixteen vehicles to five vehicles .
1414	12:00:42	12:00:43	43	DO-W	P02	<u>predator zero two</u> ,
1415	12:00:42	12:00:43	45	A06	R07	<u>rogue zero seven:</u> .
1416	12:00:43	12:00:44	43	DO-W	P02	<i>this is dragonops .</i>

# Examples of (observable) Multi-floor dialogue

**Indirect Action**



**Live Interpretation**



CHAOS