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:
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. 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 don't
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 - unrattedified overhearders
• Crossplay - ratified & unrattedified
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 ≠ current speaker
     ⇒ Addressee = previous speaker

4. Else if (active) conversational participant in same conversation
     ⇒ Addressee = participant

5. Else ?
MRE Multi-party (speech or text)
Addressee Identification: Algorithm

1. If utterance specifies addressee
   • Vocative
   • not expecting short answer or clarification of person type
     \[ \Rightarrow \text{Addressee} = \text{specified addressee} \]

2. Else If current utterance speaker is same as previous utterance speaker
     \[ \Rightarrow \text{Addressee} = \text{previous addressee} \]

3. Else If previous speaker \( \neq \) current speaker
     \[ \Rightarrow \text{Addressee} = \text{previous speaker} \]

4. Else if (active) conversational participant in same conversation
     \[ \Rightarrow \text{Addressee} = \text{participant} \]

5. Else ?
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 ≠ 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 Address 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
Ginzburg & Fernandez 2005: Scaling up

- Non-sentential utterances in Dialogue and multilogue

<table>
<thead>
<tr>
<th>NSU Class</th>
<th>Example</th>
<th>Total</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>&gt;6</th>
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<td>Acknowledgment</td>
<td><em>Mm mm.</em></td>
<td>595</td>
<td>578</td>
<td>15</td>
<td>2</td>
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<td>Short Answer</td>
<td><em>Ballet shoes.</em></td>
<td>188</td>
<td>104</td>
<td>21</td>
<td>17</td>
<td>5</td>
<td>5</td>
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<tr>
<td>Affirmative Answer</td>
<td><em>Yes.</em></td>
<td>109</td>
<td>104</td>
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<td>Clarification Ellipsis</td>
<td><em>John?</em></td>
<td>92</td>
<td>76</td>
<td>13</td>
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<tr>
<td>Repeated Ack.</td>
<td><em>His boss, right.</em></td>
<td>86</td>
<td>81</td>
<td>2</td>
<td>3</td>
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<tr>
<td>Factual Modifier</td>
<td><em>Brilliant!</em></td>
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<td>23</td>
<td>2</td>
<td>1</td>
<td>1</td>
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<td>Repeated Aff. Ans.</td>
<td><em>Very far, yes.</em></td>
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<td>25</td>
<td>1</td>
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<td>Helpful Rejection</td>
<td><em>No, my aunt.</em></td>
<td>24</td>
<td>18</td>
<td>5</td>
<td>1</td>
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<td>Check Question</td>
<td><em>Okay?</em></td>
<td>22</td>
<td>15</td>
<td>7</td>
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<tr>
<td>Filler</td>
<td><em>... a cough.</em></td>
<td>18</td>
<td>16</td>
<td>1</td>
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<td>Bare Mod. Phrase</td>
<td><em>On the desk.</em></td>
<td>16</td>
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<td>4</td>
<td>1</td>
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<td>Sluice</td>
<td><em>When?</em></td>
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<td>10</td>
<td>1</td>
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<td></td>
<td></td>
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<td>Prop. Modifier</td>
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<td>1</td>
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<td>Conjunction Phrase</td>
<td><em>Or a mirror.</em></td>
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<td>1</td>
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<td>7</td>
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<td>0.6</td>
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Table 2: NSUs sorted by Class and Distance

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<th>Distance</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>&gt;6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dialogue</td>
<td>658 (59%)</td>
<td>37 (45%)</td>
<td>11 (45%)</td>
<td>1 (12%)</td>
<td>1 (14%)</td>
<td>1 (13%)</td>
<td>0 (0%)</td>
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<tr>
<td>Multilogue</td>
<td>467 (41%)</td>
<td>45 (55%)</td>
<td>15 (55%)</td>
<td>8 (88%)</td>
<td>6 (86%)</td>
<td>7 (87%)</td>
<td>28 (100%)</td>
</tr>
</tbody>
</table>

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...

QAP QAP QAP
↓ ↓ ↓
235 236 238

Ack Ack Ack
↓ ↓ ↓
239
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]_a
[are you an Informatics student then, lj?]_b
176  tk  did not do the trials
177  wm  has anyone got wood for me?
178  gwfs [I did them]_a [because a friend did]_b
179  gwfs lol wm, you cad
180  gwfs afraid not :( 
181  lj  [no, I’m about to start math.]_a
[I just hang around appleton a lot]_b
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?
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 $B_1, \ldots, B_n$ 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.
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.

P: We don't want to harm the people either. That is my concern. We can't harm these young people (inaudible). They were doing things for the best interests of their country—that is all.

H: Well, we don't have any question here of some guy stashing money in his pocket.
Novick, Walton & Ward ‘96: Example

P: Well, what conclusions have you reached up to the moment?

H: Well, you go round and round and come up with all questions and no answers. Right back where you were at when you started.

P: Well, do you have any additional thoughts?

E: Well, I just don’t think the immunity thing will wash —

P: In a Grand Jury?

E: It may but (inaudible) John’s Grand Jury package was —

P: To get immunity for some —

E: For various witnesses.

P: Who had to go before the Grand Jury.

E: I think that you have to figure that that is out of the picture. I just don’t believe we
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
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 dialogue

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
170 p lj i did the trials
174 tk i know about it from my gf
175 gwfs [yeah me too],

[are you an Informatics student then, lj?] 
176 tk did not do the trials
177 wm has anyone got wood for me?
178 gwfs [I did them], [because a friend did]
179 gwfs lol wm, you cad
180 gwfs afraid not :
181 lj [no, I’m about to start math.]

[I just hang around appleton a lot]
182 tk sry no
183 gwfs my single wood is precious
184 wm what’s a cad?
Multiparty and Multi-floor dialogue structure

Lecture 4: Multifloor Dialogue

David Traum
Institute for Creative Technologies
University of Southern California
traum@ict.usc.edu
https://people.ict.usc.edu/~traum/
Channel management

• Two-Party
  – Who speaks when

• Multi-party
  – Which conversation is active

• Modality
  – Cross modality channels
  – Same modality channels
<table>
<thead>
<tr>
<th>Time</th>
<th>Call Sign</th>
<th>Time</th>
<th>Call Sign</th>
<th>Time</th>
<th>Call Sign</th>
<th>Time</th>
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<td>1398</td>
<td>12:00:13</td>
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<td>12:00:15</td>
<td>1400</td>
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<td>1398</td>
<td>12:00:17</td>
<td>42</td>
<td>R06</td>
<td>R07</td>
<td>predator zero two</td>
<td></td>
</tr>
<tr>
<td>12:00:13</td>
<td>1399</td>
<td>12:00:13</td>
<td>43</td>
<td>P02</td>
<td>DO</td>
<td>this is dragonops</td>
<td></td>
</tr>
<tr>
<td>12:00:15</td>
<td>1400</td>
<td>12:00:15</td>
<td>43</td>
<td>DO-W</td>
<td>P02</td>
<td>over</td>
<td></td>
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<tr>
<td>12:00:15</td>
<td>1401</td>
<td>12:00:16</td>
<td>43</td>
<td>DO-W</td>
<td>P02</td>
<td>over</td>
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<td>12:00:16</td>
<td>1402</td>
<td>12:00:16</td>
<td>43</td>
<td>DO-W</td>
<td>P02</td>
<td>over</td>
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<tr>
<td>12:00:17</td>
<td>1403</td>
<td>12:00:17</td>
<td>42</td>
<td>R06</td>
<td>R07</td>
<td>+ didn't call for the uh fifteen+ fifteen minute uh ops normal</td>
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<td>1404</td>
<td>12:00:19</td>
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<td>P02</td>
<td>DO</td>
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<td>45</td>
<td>A06</td>
<td>R07</td>
<td>anvil zero six</td>
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<td>1407</td>
<td>12:00:28</td>
<td>43</td>
<td>DO-W</td>
<td>P02</td>
<td>i have you alpha at fourteen hundred</td>
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<td>DO</td>
<td>predator zero two</td>
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<td>12:00:31</td>
<td>43</td>
<td>P02</td>
<td>DO</td>
<td>roger</td>
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<td>1411</td>
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<td>8</td>
<td>R07-A</td>
<td>R07-B</td>
<td>okay:</td>
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<td>1412</td>
<td>12:00:38</td>
<td>8</td>
<td>R07-A</td>
<td>R07-B</td>
<td>i only see uh/ five vehicles</td>
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<td>1413</td>
<td>12:00:45</td>
<td>8</td>
<td>R07-A</td>
<td>R07-B</td>
<td>confirm with anvil that the only+ his convoy has gone from sixteen vehicles to five vehicles</td>
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<td>43</td>
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<td>P02</td>
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<td>1415</td>
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<td>R07</td>
<td>rogue zero seven</td>
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<td>1416</td>
<td>12:00:44</td>
<td>43</td>
<td>DO-W</td>
<td>P02</td>
<td>this is dragonops</td>
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Examples of (observable) Multi-floor dialogue

Indirect Action

Live Interpretation
CHAOS