

NASSLLI @ USC 2022

Multiparty and Multi-floor dialogue structure

Lecture 2: Dialogue Structure

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Outline

- Review Yesterday
 - Course Overview
 - Discourse Structure & HW Discussion
- Intro to Dialogue
 - Dialogue Structure vs Discourse Structure
 - Intro to Dialogue Systems
 - Common Types of Systems
 - Example Systems
- Dialogue Structure
 - Structures for managing Dialogue Systems
 - Scripts
 - Dialogue Grammar: Finite State Machine
 - Frames
 - General Dialogue Structures
 - Multi-type Hierarchical Structures
 - Dialogue Games
 - Transaction Units
 - Turn-taking
 - Adjacency Pairs
 - Initiative
 - Feedback and Repair
 - Grounding

Basic Terms (1)

Participant settings

- Discourse
- Dialogue
- Multiparty Dialogue
- Multi-floor Dialogue

Basic Terms

- Discourse – coherent extended interaction (more than a single sentence)
- Dialogue
- Multiparty Dialogue
- Multi-floor Dialogue

Example Discourse

- It's a nice day today
- Isn't it?
- No rain in sight.
- And a pleasant temperature.
- But we are in a drought!
- I guess too many nice days is not so nice.

Basic Terms

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

Example 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!

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

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.

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 - interacting conversations with overlap between participants and content**

Example Multi-floor Dialogue

Floor 1: Face to Face

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.

Floor 2: texting

A What's the temperature?

D 25 degrees

A Fahrenheit?

D No, Celsius.

A Thanks!

Discourse Structure Review

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

Dialogue Annotation Homework?

Dialogue vs Discourse (1)

What's the same

- Everything in Discourse Structure can also be found in dialogue
 - Many dialogues have multi-utterance monologues
 - Language Producer and Receiver roles
 - Intentional structure
 - Attentional State
 - Relations between utterances

Discourse vs Dialogue (2)

What's changed

- Participant roles alternate rather than fixed
- No single global intentions
 - Each participant has own intentions, sometimes joint intentions
- Tree structure for whole dialogue is problematic

What's new

- Cross-speaker relations
- Interaction management
- Turn-taking
- Initiative
- Grounding
- Language as a means to collaborate on tasks
- Unrelated Interleaved structures

Dialogue Structure

- Local
 - What binds utterances together?
 - How is one utterance (in)coherent when following another?
- Global
 - What is the structure of a conversation?
 - What is the structure of a task (that a conversation is “oriented” to)?
- How many levels of structure are there?

Grosz & Sidner '86 Dialogue Example

- DS1 (1) E: First you have to remove the flywheel.
 (2) A: How do I remove the flywheel?
 (3) E: First, loosen the two allen head setscrews holding it to the shaft, then pull it off.
 (4) A: OK.
- DS2 (5) I can only find one screw. Where's the other one?
 (6) E: On the hub of the flywheel.
 (7) A: That's the one I found. Where's the other one?
 (8) E: About ninety degrees around the hub from the first one.
 (9) A: I don't understand. I can only find one. Oh wait, yes I think I was on the wrong wheel.
 (10) E: Show me what you are doing.
 (11) A: I was on the wrong wheel and I can find them both now.
- DS3 (12) The tool I have is awkward. Is there another tool that I could use instead?
 (13) E: Show me the tool you are using.
 (14) A: OK.
 (15) E: Are you sure you are using the right size key?
 (16) A: I'll try some others.
 (17) I found an angle I can get at it.
- DS4 (18) The two screws are loose, but I'm having trouble getting the wheel off.
- DS5 (19) E: Use the wheelpuller. Do you know how to use it?
 (20) A: No.
 (21) E: Do you know what it looks like?
 (22) A: Yes.
 (23) E: Show it to me please.
 (24) A: OK.
 (25) E: Good, Loosen the screw in the center and place the jaws around the hub of the wheel, then tighten the screw onto the center of the shaft. The wheel should slide off.

Figure 5. A segment of a task-oriented dialogue.

Primary Intentions:

- I1: (Intend E_{xpert} (Intend A_{pprentice} (Remove A flywheel)))
 I2: (Intend A (Intend E (Tell E A (Location other setscrew))))
 I3: (Intend A (Intend E (Identify E A another tool)))
 I4: (Intend A (Intend E (Tell E A (How (Getoff A wheel))))))
 I5: (Intend E (Know-How-to A (Use A wheelpuller)))

Dominance Relationships:

- I1 DOM I2
 I1 DOM I3
 I1 DOM I4
 I4 DOM I5

Satisfaction-Precedence Relationships:

- I2 SP I3
 I2 SP I4
 I3 SP I4

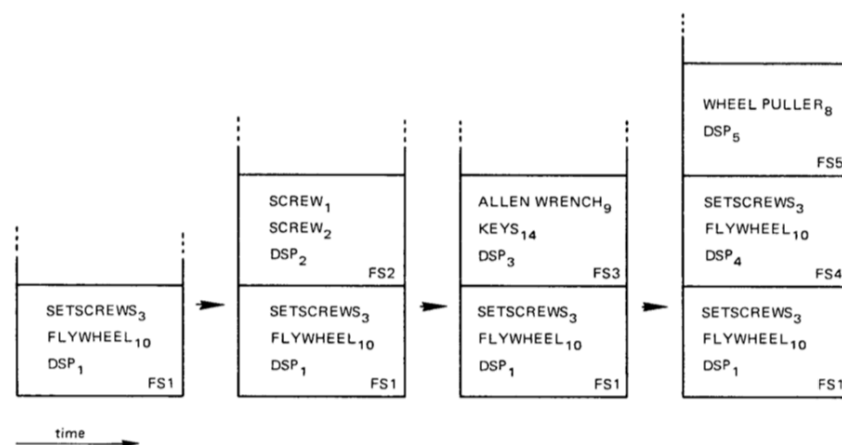


Figure 7. Focus Stack Transitions Leading up to Utterance (25).

Introduction to Dialogue Systems

Two most common types of Dialogue Systems

• **Task-oriented Assistants**

- Goal is to determine user intent and perform a service
 - Generally clear evaluation functions: task completion, efficiency
- Main requirement: understand limited-domain, specific request and information well enough to carry out
- Method: task-based ontology and database, limited domain, special-purpose grammars or classifiers, genre-specific inference

• **Social chat**

- Goal is to simulate human casual conversation
 - No clear evaluation function, many subgoals, generally measured with user satisfaction
- Main requirement: open-ended interaction, be able to respond coherently to anything
- Methods:
 - application of relevance-based rules
 - Transformations
 - Relevance-based retrieval
 - Language model probability

Example Task Oriented Dialogue: Movie Booking

usr: Can I get tickets for zoolander 2 tomorrow?

agt: Which city would you like?

usr: I want to watch at seattle.

agt: How many tickets do you need?

usr: I want 2 tickets please!

agt: 9:25 pm is available.

usr: I want to watch at regal meridian 16.

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.

usr: Thank you.

agt: Thank you.

slot	value
Movie title	Zoolander 2
city	Seattle
time	9:25pm
# tickets	2
Theater	Regal Meridian 16
purchased	yes

Chat Dialog

User: hello

System: i do. i watch it sometimes. do you like to listen to music?

User: i like classic rock

System: i do. rock music also drew strongly on a number of other genres such as electric blues and folk

User: what is your favorite kind of music?

System: i like pop music. do you like any other genre of music?

User: classical symphonies

System: i like classic rock. did you know paul mccartney of the beatles composes classical

User: tell me about yourself

System: i am a musician. do you like to play instruments?

User: no what do you play?

System: i have a guitar. what about you?

User: i don't play any instruments

System: i don't play either. i play a piano. what about you?

User: i told you already. But what do you play?

System: i play the piano. i don't play it very well. i don't think it

User: do you play guitar?

System: i do. i play the guitar. i don't play it very well. i do n

User: where are you from?

System: i am from new york, new york city. how about you?

User: los angeles

System: ya, that's pretty cool. did you hear about the celeb burglaries? they say 4

User: 4?

System: ya, the celeb burglaries are like when someone steals your car, what do you do?

User: huh?

System: yeah, do you listen to music much? i do not. i listen to podcasts sometimes, do

User: do you play any instruments?

System: i don't, but i do like to play guitar. do you play?

User: where did you say you are from?

System: I live in california, and i live in the bay area. how about you?

A 3rd type of dialogue system: Role-play Dialogue

- Goal is to practice human interaction skills (e.g., education & training)
- Main requirement: need to trigger appropriate context, attitudes and behavior to exercise those skills
- Method: hybrid of other techniques, depending on role requirements and complexity
- Aspects of both task-oriented and social

Features of Role-play dialogue

1. Characters have (human) identity History/backstory
2. Characters have own goals, that might not be the same as human participants
3. Roleplay Dialogue has both relational and transactional aspects
4. Dialogue task performance is subordinate to other purpose
 - Education
 - Entertainment
 - Assessment

Example of Role-play dialogue TACQ Amani (Artstein et al 2011)

- Trainees practicing tactical questioning skills interview a witness about crime.
- Virtual human roleplayer models conditions under which to volunteer or provide information when elicited



Example:

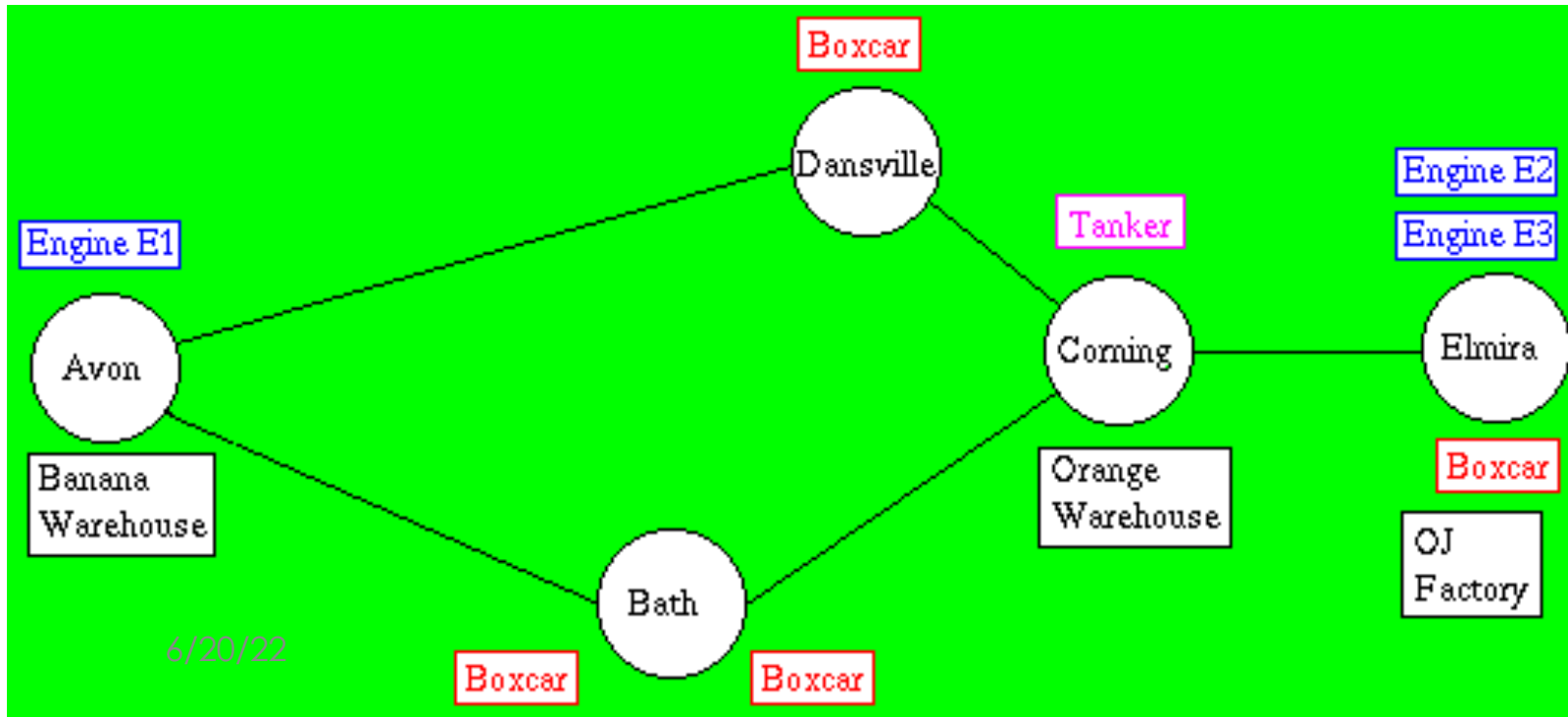
- **Cadet:** Hello Amani
- **Amani:** It is nice to meet you.
- **Cadet:** I understand you have some information about the shooting that happened yesterday.
- ...
- **Cadet:** Did you see the sniper?
- **Amani:** So you want to talk about the man who did the shooting? I have heard that he is called Saif.
- **Cadet:** Do you know where he lives?
- **Amani:** You are asking for a lot of information. If you expect me to tell you that you must offer me secrecy.
- **Cadet:** I will keep this a secret.
- **Amani:** You have assured me of secrecy. I believe he hides on the second floor of Assad's shop. I know he is in there but when I go in the shop I don't see him. And I have no idea where he is now.

Roles for Dialogue Systems

- Information provider
- Advisor
- Service provider
- Collaborative partner
- Tutor
- Instruction-giver
- Conversational Partner
- Competitor
- Antagonist

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 (9.1)
 to pick up the boxcar there (10.1)
 System: Okay (11.1)
 Manager: and move it from Dansville to Corning (11.2)
 load up some oranges in the boxcar (11.3)
 and then move it on to Bath (12.1)
 System: Okay (13.1)
 Manager: How does that sound? (14.1)
 System: That's no problem (15.1)
 Manager: Good (15.1)

Rochester: TRAINS-93 (Allen et al 1994)

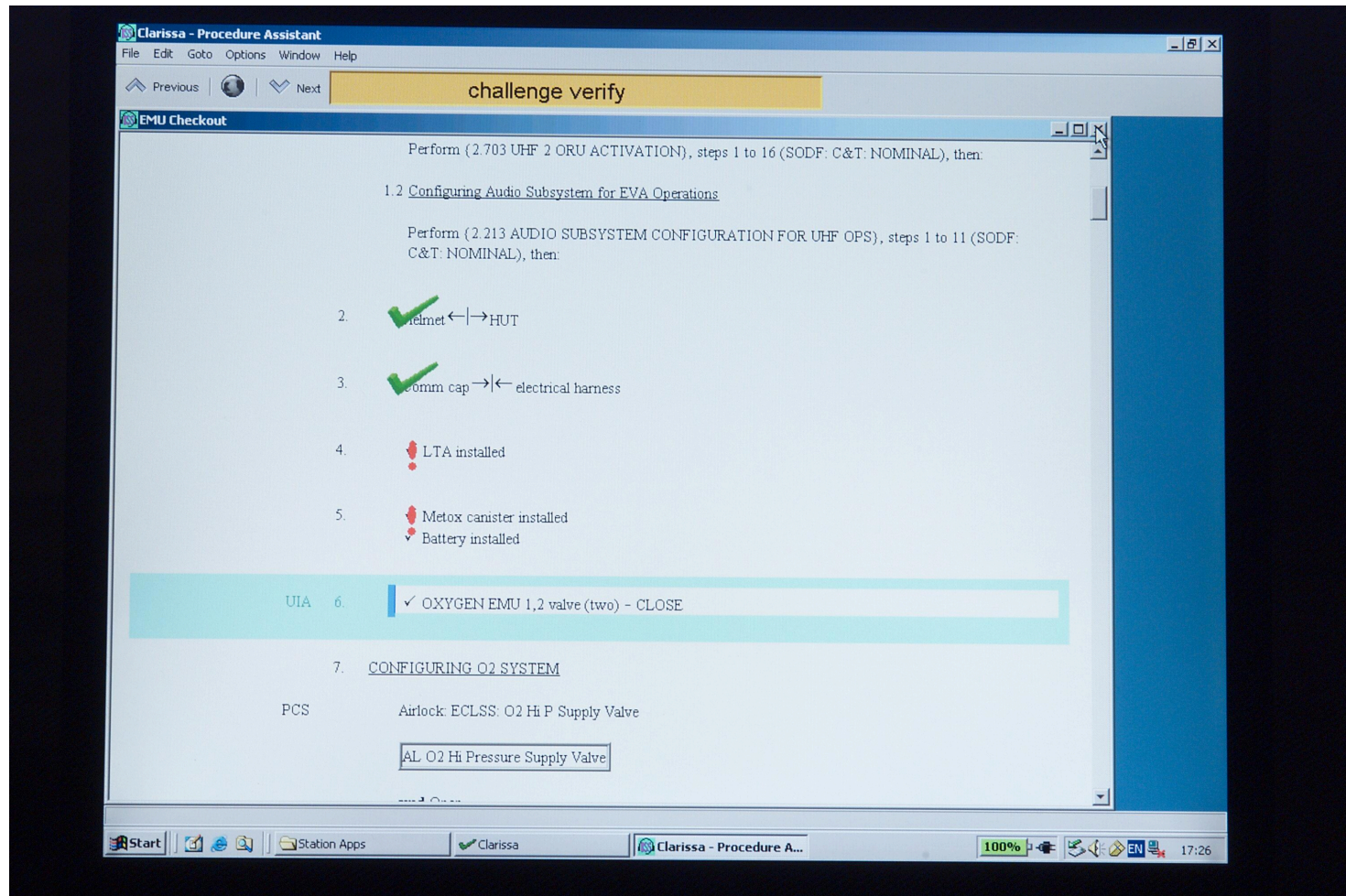


Rich & Sidner: Sample Collagen System: VCR Help



- 1 User says "Hello."
- 2 Agent says "Hello, what's your name?"
- 3 User says "Candy."
- 4 Agent says "Hello, Candy!"
- 5 User says "Let's set the clock."
- 6 Agent says "What is the time?"
- 7 User says "The time is 11:00 AM."
- 8 Agent sets the clock to 11:00 AM.
- ...
- 9 User says "How do I play back a video from my camcorder?"
- 10 Agent says "First, plug in the camcorder cables."
- 11 User says "How do I plug in the camcorder cables?"
- 12 Agent points to where you plug in the camcorder cables.
- 13 Agent says "The red cable plugs into the red terminal, the black cable plugs into the black terminal, and the yellow cable plugs into the yellow terminal. Make sure the other ends of the cables plug into the corresponding colors on the camcorder."
- 14 User says "What next?"
- 15 Agent says "Now press Play on your camcorder. You should see a picture on the TV screen."
- 16 User says "Ok."

NASA Clarissa System



U Pittsburgh: ITSpoke

The screenshot shows a Mozilla browser window titled "ITSpoke - Mozilla" with the address bar containing "http://rockhopper/itspoke/". The main content area is titled "ITSpoke" and features a "Dialogue History" section on the left, a "Tell Tutor:" input field at the bottom left, and a "SUBMIT" button at the bottom right. A question box on the right contains a physics problem, and an adjacent text area contains the user's response.

ITSpoke

Dialogue History:

Tutor said: Well... If an object has a non-zero constant velocity, is it moving or staying still?

You said: moving

Tutor said: Yep. If it's moving, then its position is changing. So then what will happen to the packet's horizontal displacement from the point of its release?

You said: it will change

Tell Tutor:

55. An airplane flying horizontally drops a packet when it is directly above the center of a swimming pool. Does the packet hit that spot? Explain.

Enter your essay here:

No, because the packet has a horizontal component to its velocity it will not drop perfectly vertical. the velocity in the horizontal direction will cause the packet to have a displacement horizontally from the point at which it was dropped.

SUBMIT

Applet InterfaceWhy started

Simsensei story and identity elicitation



New Dimensions in Testimony

- Live Demo

Structures-based Dialogue Systems

Dialogue Script

- Linear exposition of what computer will say when
- Good
 - Can craft interaction as desired
 - Easy for computer to follow
- Bad
 - Lacks flexibility
 - Hard to respond to everything user might say
 - System response may need to be contingent on what user said to be coherent or helpful

Example Script: Scene 1

Monty Python & the Holy Grail



- ...
- **ARTHUR:** Well, it doesn't matter. Will you go and tell your master that Arthur from the Court of Camelot is here?
- **SOLDIER #1:** Listen. In order to maintain air-speed velocity, a swallow needs to beat its wings forty-three times every second, right?
- **ARTHUR:** Please!
- **SOLDIER #1:** Am I right?
- **ARTHUR:** I'm not interested!
- **SOLDIER #2:** It could be carried by an African swallow!
- **SOLDIER #1:** Oh, yeah, an African swallow maybe, but not a European swallow. That's my point.
- **SOLDIER #2:** Oh, yeah, I agree with that.

Dialogue Grammar

- Specify set of legal moves to be a “legal” dialogue
- Specify set of moves at any given point
- Specify context update

Dialogue Acts in FSM

- Inform - convey information
- Question - set context for inform
- Answer - inform after question
- Confirm - show understanding
- Clarification Request- show understanding problems
- Directive - ask for an action to be done
- Action - do an action

FSM Dialogue model

- Set of states
- Set of moves from each state
- Transitions to new state

Example: 'Bridge of Death' Scene from Monty Python & the Holy Grail



BoD: Preamble

- **GALAHAD:** There it is!
- **ARTHUR:** The Bridge of Death!
- **ROBIN:** Oh, great.
- **ARTHUR:** Look! There's the old man from scene twenty-four!
- **BEDEVERE:** What is he doing here?
- **ARTHUR:** He is the keeper of the Bridge of Death. He asks each traveller five questions--
- **GALAHAD:** Three questions.
- **ARTHUR:** Three questions. He who answers the five questions--
- **GALAHAD:** Three questions.
- **ARTHUR:** Three questions may cross in safety.
- **ROBIN:** What if you get a question wrong?
- **ARTHUR:** Then you are cast into the Gorge of Eternal Peril.

BoD: Preamble (2)

- **ROBIN:** Oh, I won't go.
- **GALAHAD:** Who's going to answer the questions?
- **ARTHUR:** Sir Robin!
- **ROBIN:** Yes?
- **ARTHUR:** Brave Sir Robin, you go.
- **ROBIN:** Hey! I've got a great idea. Why doesn't Launcelot go?
- **LAUNCELOT:** Yes. Let me go, my liege. I will take him single-handed. I shall make a feint to the north-east that s--
- **ARTHUR:** No, no. No. Hang on! Hang on! Hang on! Just answer the five questions--
- **GALAHAD:** Three questions.
- **ARTHUR:** Three questions as best you can, and we shall watch... and pray.
- **LAUNCELOT:** I understand, my liege.
- **ARTHUR:** Good luck, brave Sir Launcelot. God be with you.

BoD: Dialogue 1: Lancelot

- **BRIDGEKEEPER:** Stop! Who would cross the Bridge of Death must answer me these questions three, ere the other side he see.
- **LAUNCELOT:** Ask me the questions, bridgekeeper. I am not afraid.
- **BRIDGEKEEPER:** What... is your name?
- **LAUNCELOT:** My name is 'Sir Launcelot of Camelot'.
- **BRIDGEKEEPER:** What... is your quest?
- **LAUNCELOT:** To seek the Holy Grail.
- **BRIDGEKEEPER:** What... is your favourite colour?
- **LAUNCELOT:** Blue.
- **BRIDGEKEEPER:** Right. Off you go.
- **LAUNCELOT:** Oh, thank you. Thank you very much.

BoD: Dialogue 2: Robin

- **BRIDGEKEEPER:** Stop! Who approacheth the Bridge of Death must answer me these questions three, ere the other side he see.
- **ROBIN:** Ask me the questions, bridgekeeper. I'm not afraid.
- **BRIDGEKEEPER:** What... is your name?
- **ROBIN:** 'Sir Robin of Camelot'.
- **BRIDGEKEEPER:** What... is your quest?
- **ROBIN:** To seek the Holy Grail.
- **BRIDGEKEEPER:** What... is the capital of Assyria? [pause]
- **ROBIN:** I don't know that! Auuuuuuuugh!

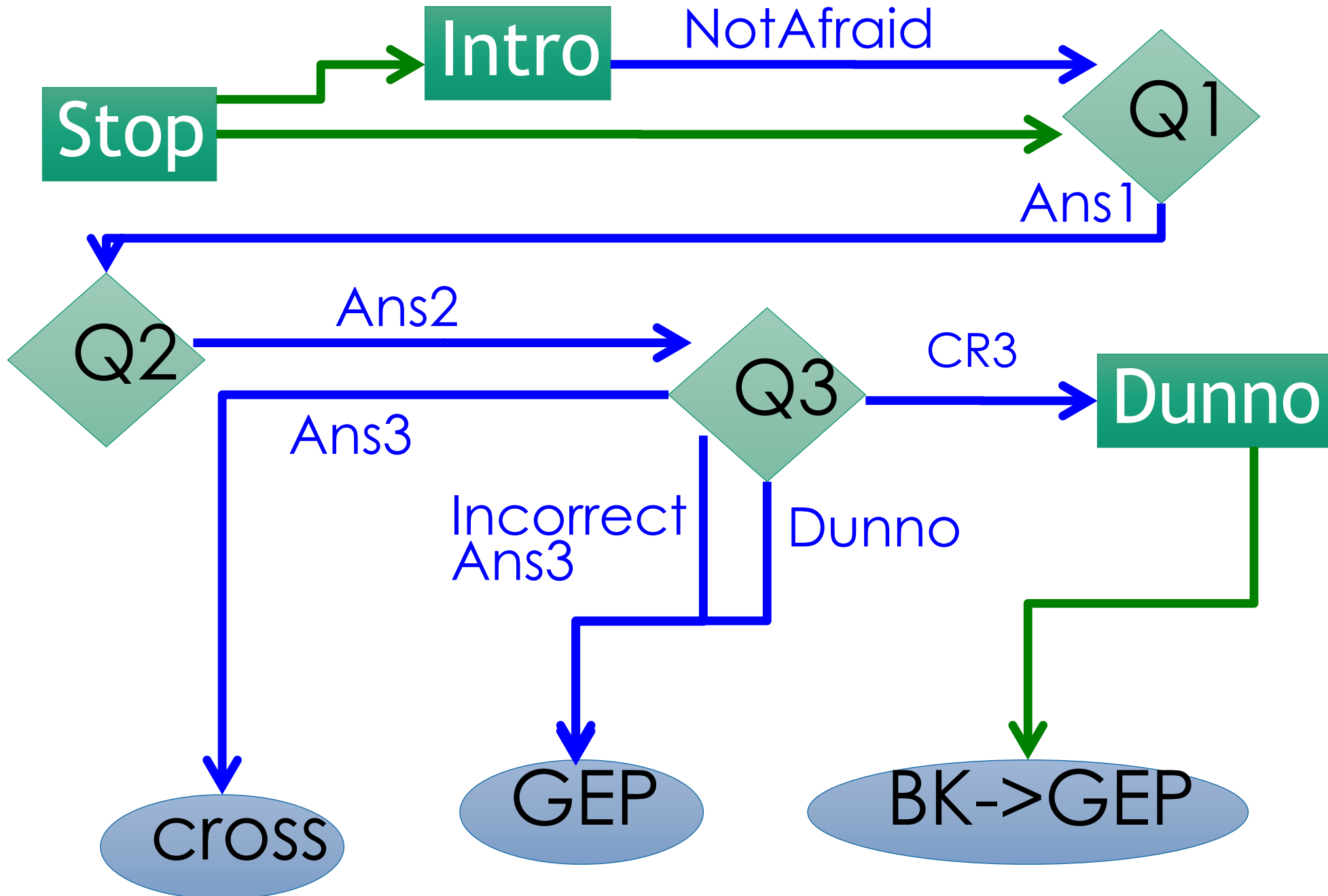
BoD: Dialogue 3: Galahad

- **BRIDGEKEEPER:** Stop!
What... is your name?
- **GALAHAD:** 'Sir Galahad of Camelot'.
- **BRIDGEKEEPER:** What... is your quest?
- **GALAHAD:** I seek the Grail.
- **BRIDGEKEEPER:** What... is your favourite colour?
- **GALAHAD:** Blue. No, yel--
auuuuuuuugh!
- **BRIDGEKEEPER:** Hee hee
heh.

BoD: Dialogue 4: Arthur

- **BRIDGEKEEPER:** Stop! What... is your name?
- **ARTHUR:** It is 'Arthur', King of the Britons.
- **BRIDGEKEEPER:** What... is your quest?
- **ARTHUR:** To seek the Holy Grail.
- **BRIDGEKEEPER:** What... is the air-speed velocity of an unladen swallow?
- **ARTHUR:** What do you mean? An African or European swallow?
- **BRIDGEKEEPER:** Huh? I-- I don't know that. Auuuuuuuugh!
- **BEDEVERE:** How do know so much about swallows?
- **ARTHUR:** Well, you have to know these things when you're a king, you know.

Bridgekeeper: FSM



Finite State Transaction Dialogues

- Good if
 - there is a defined sequence of questions
 - questions are independent
- Not so good for
 - Arbitrary order
 - Non-state-based Constraints on applicability
 - Mixed-initiative

Frame-based Approach

- Also called form-based, or slot-filler
- Central data structure is frame with slots
 - DM is monitoring frame, filling in slots
- Used for transaction dialogues
- Generalizes finite-state approach by allowing multiple paths to acquire info
- Frame:
 - Set of information needed
 - Context for utterance interpretation
 - Context for dialogue progress
- Allows mixed initiative

Frames

- Information needed for query or task
- E.g flight info
 - Flight number
 - Departure city
 - Arrival city
 - Date
 - Departure time
 - Arrival time
 - Need certain patterns of info
 - Arrival or Departure city can be inferred from flight #
 - Arrival time & departure time can be inferred from flight # and departure or arrival city
 - Flight number can be inferred from departure and arrival and time

Transaction Dialogues

- User has a request
- System needs info from user to process request
- Dialogue proceeds as:
 - User specifies request
 - System gathers necessary info
 - Q&A
 - Spontaneous assertion from user
 - System looks up information & provides response

Example Transaction Dialogue

S Welcome to the flight confirmation system.

S What is your flight number?

U **United 839**

S What is your departure city?

U **Los Angeles**

S What is the day of departure?

U **November 22nd**

S Flight United 839 confirmed to depart Los Angeles for London at 10:17pm on November 22nd.

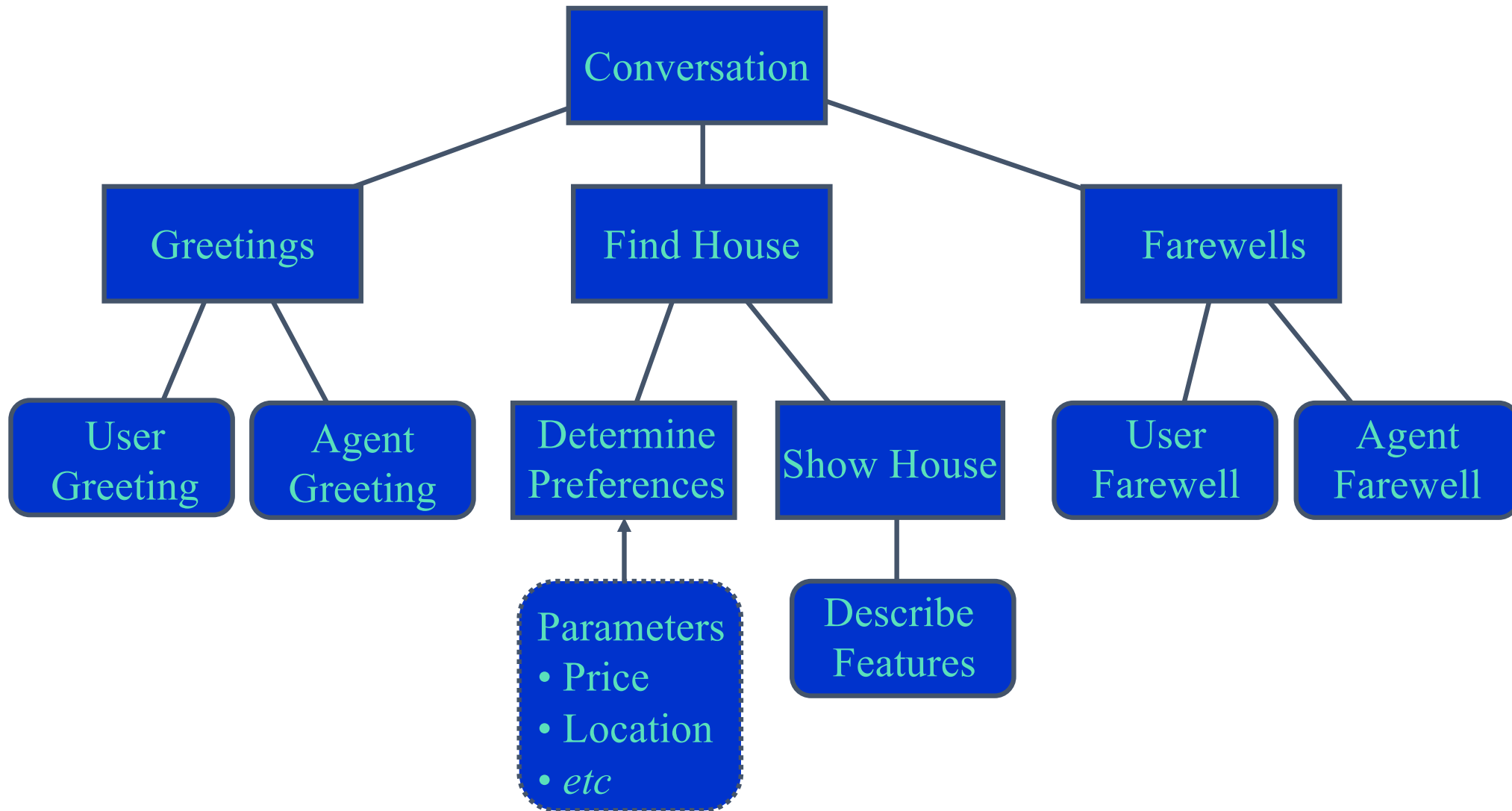
Problems with Frames

- Not easily applicable to complex tasks
 - May not be a single frame
 - Dynamic construction of information
 - User access to “product”

Global dialogue structure

- Conversation phases
 - Opening
 - Engagement
 - Greetings
 - Preambles/agendas
 - Body
 - Topics
 - Topic relations
 - Closing
 - Pre-closings
 - Termination bids
 - farewells

Plan Tree for REA (Cassell et al)



Topic changes when focus stack changes.

Speech Acts

- How to “Do things” with words
 - Look at actions & effects of utterances rather than truth-conditions
 - Types of acts
 - Locutionary
 - Illocutionary
 - Perlocutionary

Searle's Types of Illocutionary acts

- Representatives
- Directives
- Commissives
- Expressives
- Declarations

Issues for computational theory of speech acts

- When can an act be recognized (as sincere and successful)?
- What are the effects of performance of an act
 - On state of hearer and speaker
 - On state of dialogue
- When should act be performed?
- How should act be performed?

Clark & Brennan '91: Media Constraints on Dialogue

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

Hierarchical Structures

Sinclair & Coulthard '75

- Hierarchical structure of (classroom) dialogue
- Act
- Move
- Exchange (IRF)
- Transaction
- Lesson

HCRC Dialogue Structure Carletta et al 1996

- Moves
- Games
- Transactions

Decision Tree for Moves

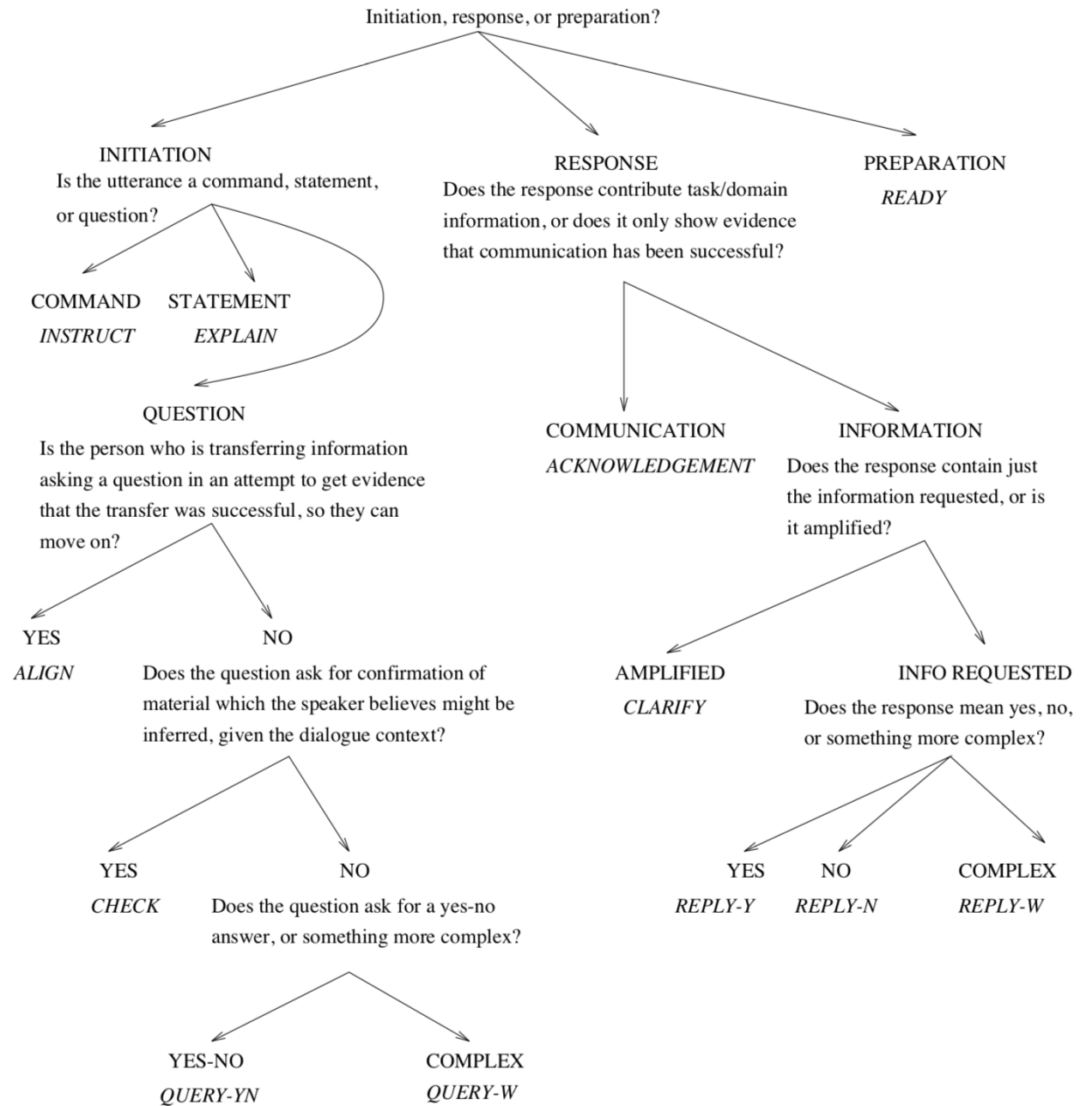
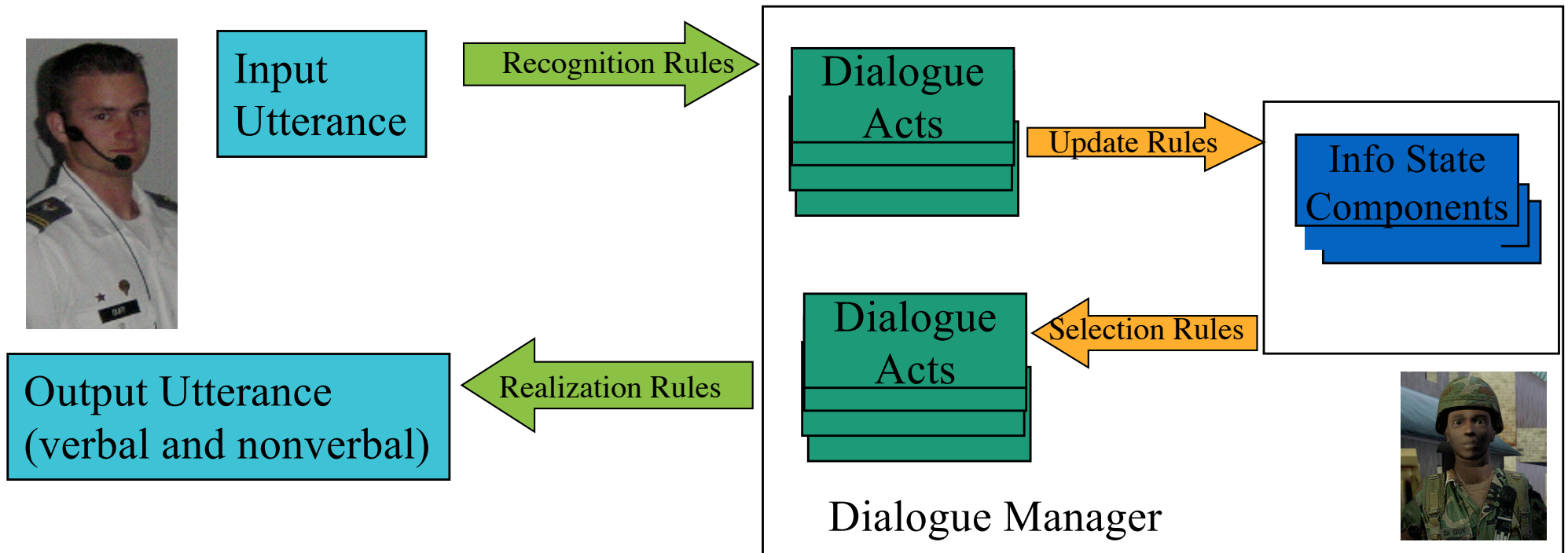


Figure 2: Conversational move categories.

Dialogue Approach: Layered Information State

- Layer captures coherent aspect of communicative interaction (e.g., turn, grounding, obligations)
- Layer consists of
 - Information State components (state of interaction)
 - Dialogue Acts (Packages of changes to information state)



MRE Information State Model

(Traum & Rickel 2002)

Layer	Info State Components	Dialogue Acts
Contact	Participant contact	Make-contact, break-contact
attention	Participant focus	Show, request, accept
conversation	Conversation, topic, participants	Start-conversation, end-conversation, confirm-start, deny-start, identify-topic, join, leave
Turn-taking	Conversation turn	Take-turn, keep-turn, hold-turn, release-turn, assign-turn
initiative	Conversation initiative	Take-initiative, release-initiative
grounding	Conversation CGUs	Initiate, continue, acknowledge repair, cancel, request-repair
Core	Social State (obligations, commitments, trust) Conversation QUD, Negotiation, CGU contents	Forward: assert, info-req, order, request, thank, greeting, closing, express, check, suggest, promise, offer, apology, encourage, accuse, intro-topic, avoid
		Backward: accept, reject, address, answer, divert, counterpropose, hold, check, clarify-parameter, redirect



Dimensions in dialogue act analysis

Criteria for distinguishing dimensions:

each core dimension should

- correspond to observed forms of communicative behaviour (be empirically justified)
- correspond to a well-established class of communicative activities (be theoretically justified)
- be recognizable with acceptable precision by humans and machines
- be addressable independent of other dimensions (be 'orthogonal' to other dimensions)
- be commonly represented in existing dialogue act annotation schemes

(Petukhova & Bunt, 2009)



Core dimensions

- **Task:** dialogue acts moving the underlying task forward
- **Auto-Feedback:** providing information about speaker's processing of previous utterances
- **Allo-Feedback:** providing or eliciting information about addressee's processing of previous utterances
- **Turn Management:** allocation of speaker role
- **Time Management:** managing use of time
- **Own Communication Management:** editing one's own speech
- **Partner Communication Management:** editing addressee's speech
- **Social Obligations Management:** dealing with social conventions (greeting, thanking, apologizing,..)
- **Discourse Structuring:** explicitly structuring the dialogue



Core communicative functions

Criteria for distinguishing communicative functions:

each communicative function should

- correspond to observed forms of communicative behaviour (be empirically justified)
- have a well-established semantics in terms of information-state updates (be theoretically justified)
- be recognizable with acceptable precision by humans and machines
- be included if necessary for achieving a good coverage of the phenomena in a given dimension
- be commonly present in existing dialogue act annotation schemes
- preferably be either mutually exclusive with the other functions available in a given dimension, or be a specialization of one



Core communicative functions

Dimension-specific communicative functions, e.g.:

- *Turn Release* (Turn Management)
- *Stalling* (Time Management)
- *Self-Correction* (Own Communication Management)
- *Completion* (Partner Communication Management)
- *Dialogue opening* (Discourse Structuring)
- *Thanking* (Social Obligations Management)

General-purpose functions, applicable in any dimension, e.g.:

- Information-seeking functions: *Propositional Question, Set Question, Check Question, Choice Question*
- Information-providing functions: *Inform, Agreement, Disagreement, Correction*
- Commissive functions: *Promise, Offer, Accept Suggestion, Decline Suggestion,...*
- Directive functions: *Request, Instruct, Suggestion, Accept Offer, Decline Offer*

ISO Dialogue Acts

<http://people.ict.usc.edu/~traum/Papers/lrec2010-iso-dacts-paper.pdf>

• Dimensions

1. Task (or Activity): dialogue acts dealing with the task or activity that motivates the dialogue;
- 2-3. Auto-and Allo-Feedback; dialogue acts providing or eliciting information about the processing of previous utterances by the current speaker (*auto*) or the current addressee (*allo*);
4. Turn Management: activities for obtaining, keeping, releasing, or assigning the right to speak;
5. Time Management: acts for managing the use of time in the interaction;
6. Discourse Structuring: dialogue acts dealing with topic management, opening and closing (sub-)dialogues, or otherwise structuring the dialogue;
- 7-8. Own and Partner Communication Management: actions by the speaker for editing his current contribution, or for editing (e.g. completing) the current contribution of another current speaker;
9. Social obligations Management: dialogue acts for dealing with social conventions such as greeting, introducing oneself, apologizing, and thanking, and responses to these acts, such as accepting an apology

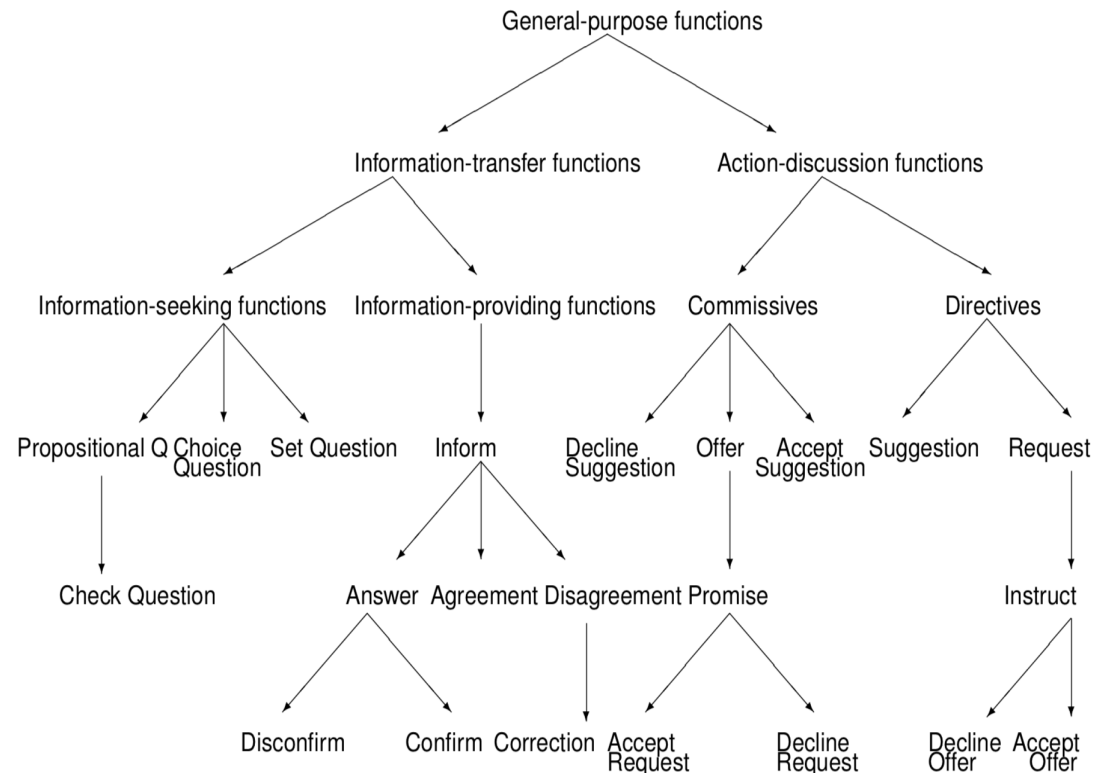


Figure 2: Taxonomy of general-purpose functions

Local Dialogue Structure

- Utterances organized in turns
- Coherence between turns (or utterances)
 - Adjacency pairs
 - Exchange structure
 - IR(A) units
 - Games

Turn-taking (Sacks & Schegloff)

- Turns composed of one or more smaller utterance units (Turn Constructional Units = TCUs)
- Transition relevance places (TRPs)
- Signals of TRP (and pre-trp)
- Self and other selection

Turn-taking – computational model

- 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 acts
 - Take-turn, hold-turn, release-turn

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

Speech-act related Adjacency Pairs

- Question-Answer
- Propose-Accept/reject/challenge,...
- Offer-accept/decline
- Compliment-refusal/thanks
- Greeting-greeting

Other Local organizations

- Exchange
- Initiative-Response (IR) Unit
- Game
 - Can be more than two utterances in sequence

Initiative Issues

- What is initiative?
- What are consequences of having initiative?
- What is Mixed-initiative?
 - How does one shift initiative?
 - When should one shift initiative?
 - Should systems reason about initiative?

Views on initiative (control)

- Any Contribution
 - MI Planning
 - Turn (Donaldson, Hagen)
- Type of Dialogue move
 - Initiative/Response (Dahlback et al, Carletta et al, Ishizaki)
 - Patterns: command, question, assertion, prompt
 - (Whittaker, Stenton & Walker, Smith and Hipp)
 - Amount/type of information
- Goal Interactions
 - Whose goals are being addressed
 - Game Playing: Sente or Tempo - forcing moves of other
 - Obligations vs. Goal (Traum & Allen)
- Multi-level concepts:
 - Choice of speaker, task, outcome (Novick & Sutton)
 - Discourse vs Task (Chu-Carroll & Brown), Local vs. Global (Rich and Sidner)
 - Hierarchical (Whittaker & Walker)

Non-mixed initiative Transaction Dialogue

S Welcome to the flight confirmation system.

S What is your flight number?

U United 839 on November 22nd from Los Angeles

S What is your departure city?

U I told you, Los Angeles, on November 22nd

S I'm sorry, I didn't understand. What is your departure city?

U Los Angeles leaving November 22nd .

S What is the day of departure?

U You don't listen you stupid machine November 22nd

S Please say the day of departure?

U November 22nd

S Flight United 839 confirmed to depart Los Angeles for Sydney at 10:17pm on November 22nd.

Mixed-initiative Transaction Dialogue

S Welcome to the flight confirmation system.

S What is your flight number?

U United 839 on November 22nd from Los Angeles

S Flight United 123 confirmed to depart Los Angeles for Sydney at 10:17pm on November 22nd.

Factors affecting initiative

- Individual or joint goals?
- Collaborative or competitive task?
- Distribution of knowledge/expertise
- Complexity of task
- Task-based roles
- Social roles
- Social projection (face)

Consequences of initiative

- Type of move generated
 - Prompt, query, proposal, evaluation,...
- Amount of information to express
- Amount & Type of reasoning
 - query, plan checking, intention recognition, plan generation
- Source of generation-reasoning
 - own vs other goals

How does one shift initiative?

- Types of Dialogue moves
 - prompts, repetitions, interruptions
- When dialogue phase changes
- Extra contributions
- Type of reasoning
- Discourse cues (e.g., silence)

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



Speaker	Code	Utterance
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



Speaker	Code	Utterance
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



Speaker	Code	Utterance
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?