

CS 599: Computational Models of Dialogue Modelling - Fall 2005

Lecture 2: Intro to Dialogue Structure & simple Dialogue models

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Outline

- Followup
 - Email list
 - Homework Discussion
 - Question Discussion
- Today's topics
 - Dialogue Structure
 - Local structure
 - Global structure
 - Eliza & Chat systems
 - Finite State systems
 - RAD



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?

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



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

Other Local organizations

- Exchange
- IR Unit
- Game
 - Can be more than two utterances in sequence

Global dialogue structure

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

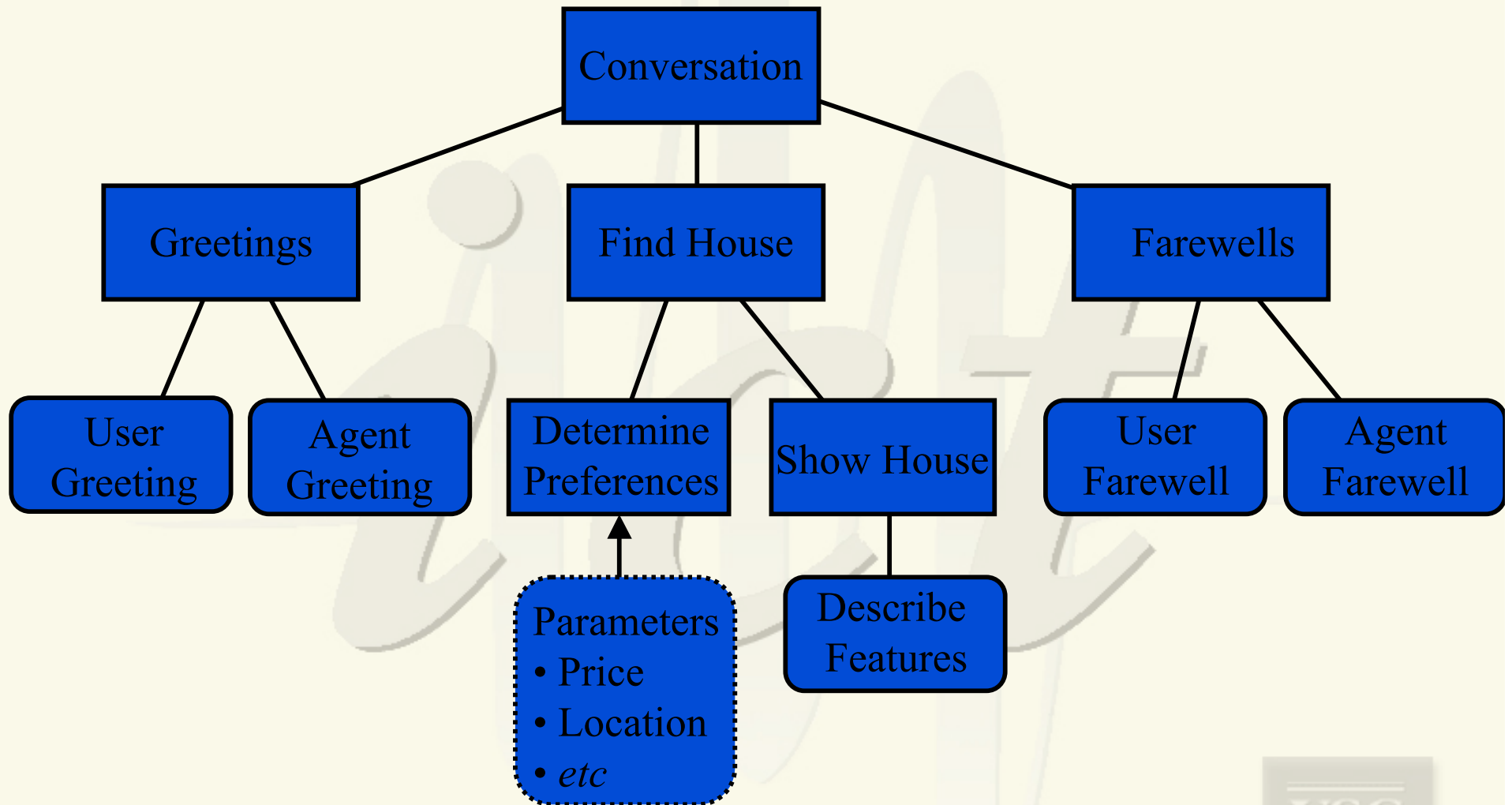


Task Structure

- Hierarchical & sequential tasks
 - Linear precedence
 - Immediate dominance
- Topic stack
- Topic transitions
 - Push
 - Pop
 - Pop-push



Plan Tree for REA (Cassell et al)



Topic changes when focus stack changes.



Simple Organizational Structures

- Script
- Local
 - Exchange
 - Word-based
 - Keyword spotting
 - Advanced techniques
 - » AIML recursion
 - » Statistical Language model
 - Meaning-based
 - Speech acts
- Grammar
- Tree/FSM

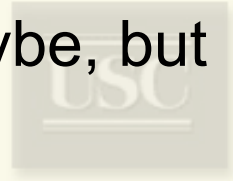


Example Script: Scene 1

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.



Eliza

- Local organization
- Produce response based on analysis of input
 - Keyword spotting
 - Pattern recognition
 - Pattern selection
 - Transformation rules
- Example: emacs Doctor program
- Example 2: CL simple-eliza rules
- <http://hampshire.edu/lspector/courses/eliza-simple.lisp>

Advanced Patterns: AIML

- XML Syntax
- Stimulus-response interaction
- Categories
 - Pattern
 - Template



AIML: Advanced

- Srai operator
 - Synonyms
 - Splitting patterns
 - conditionals
- Context
 - That
 - Topic
 - set
- System calls
- Get & set variables



Speech Acts

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

Types of Illocutionary act

- 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?

Speech-act related Adjacency Pairs

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

Dialogue Grammar

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



FSM Dialogue model

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

Dialogue Acts in FSM

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



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-- auuuuuuuuugh!
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: Local structure

- (left as an exercise)



Bridgekeeper: FSM

- Draw on board

