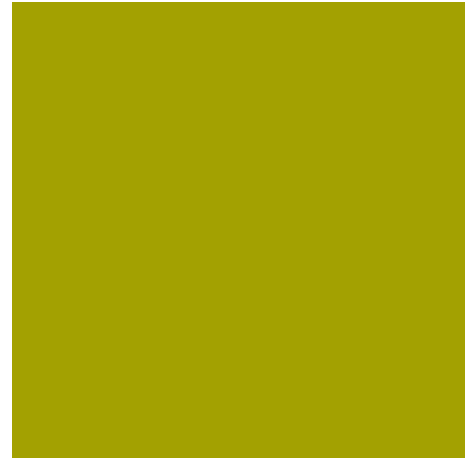




Dialog:  
What characterizes  
human dialog?

Warning: We can't do any  
of this in computer dialog



## CS 115 Lecture 5 Dialog

June 14, 2018  
Professor Meteer



# + A travel dialog: Communicator

## Xu and Rudnicky (2000)



S1: Hello. You've reached the [Communicator]. Tell me your full name.

U2: Hi, I'd like to fly to Seattle Tuesday morning

S3: Traveling to Seattle on Tuesday, August 11<sup>th</sup> in the morning. Your full name?

U4: John Doe

S5: Hello, John. I'm glad to hear from you **again**. **OK**. Let's see, I have a United flight departing Pittsburgh at 10:45 am arriving into Seattle at 1:57 pm. **Is that OK?**

U6: Yes

S7: Will you return to Pittsburgh from Seattle?

U8: No, I will go on to Los Angeles

S9: **Travelling to Los Angeles** on what date

U10: Sorry, can we go back to the previous **leg** again

S11: **For the first leg**, you are on United flight 1446 departing Pittsburgh at 10:45 AM tomorrow, arriving in Seattle at 1:57 PM. Do you want to take that?

U12: Actually, I want to leave Wednesday

S13: A flight Wednesday. I have a flight departing Pittsburgh at 10:45 AM tomorrow, arriving in Seattle at 1:57 PM. Is that OK?

U:14 Yes.

# + Linguistics of Human Conversation



- Turn-taking
- Speech Acts
- Grounding
- Conversational Structure
- Implicature

# + Turn-taking



- Dialogue is characterized by turn-taking.
  - A:
  - B:
  - A:
  - B:
  - ...
  
- Resource allocation problem:
  - How do speakers know when to take the floor?
  
- Sacks et al. (1974)
  
- At each transition-relevance place of each turn:
  - a. If during this turn the current speaker has selected B as the next speaker then B must speak next.
  - b. If the current speaker does not select the next speaker, any other speaker may take the next turn.
  - c. If no one else takes the next turn, the current speaker may take the next turn.

# + Implications of subrule A



- For some utterances the current speaker selects the next speaker
  - Adjacency pairs
    - Question/answer
    - Greeting/greeting
    - Compliment/downplayer
    - Request/grant
- Silence between 2 parts of adjacency pair is different than silence after the end of a topic
  - A: Is there something bothering you or not?
  - (1.0)
  - A: Yes or no?
  - (1.5)
  - A: Eh
  - B: No.
- Consider this in the context of a slow to respond speech system

# + Speech Acts



## ■ Austin (1962): An utterance is a kind of action

### ■ Clear case: **performatives**

- I name this ship the Titanic
- I second that motion
- I bet you five dollars it will snow tomorrow

### ■ Performative verbs (name, second)

### ■ Austin's idea: not just these verbs

## ■ Each utterance is 3 acts

### ■ **Locutionary act**: the utterance of a sentence with a particular meaning

### ■ **Illocutionary act**: the act of asking, answering, promising, etc., in uttering a sentence.

### ■ **Perlocutionary act**: the (often intentional) production of certain effects upon the thoughts, feelings, or actions of addressee in uttering a sentence.

### **“You can't do that!”**

Illocutionary force:

Protesting

Perlocutionary force:

**Effect** of annoying addressee

**Effect** of stopping addressee from doing something

## + The 3 levels of act revisited



	Locutionary Force	Illocutionary Force	Perlocutionary Force
<b><i>Can I have the rest of your sandwich?</i></b> Or <b><i>Are you going to finish that?</i></b>	Question	Request	Effect: You give me sandwich (or you are amused by my quoting from “Diner”)
<b><i>I want the rest of your sandwich</i></b>	Declarative	Request	Effect: as above
<b><i>Give me your sandwich!</i></b>	Imperative	Request	Effect: as above.

# + 5 classes of speech acts: Searle (1975)



- **Assertives:** committing the speaker to something's being the case
  - (*suggesting, putting forward, swearing, boasting, concluding*)
- **Directives:** attempts by the speaker to get the addressee to do something
  - (*asking, ordering, requesting, inviting, advising, begging*)
- **Commissives:** Committing the speaker to some future course of action
  - (*promising, planning, vowing, betting, opposing*).
- **Expressives:** expressing the psychological state of the speaker about a state of affairs
  - (*thanking, apologizing, welcoming, deploring*).
- **Declarations:** bringing about a different state of the world via the utterance
  - (*I resign; You're fired*)



# + Verbmobil Dialogue Acts (1995)

Speech only dialog system for planning appointments



THANK	thanks
GREET	Hello Dan
INTRODUCE	It's me again
BYE	All right, bye
REQUEST-COMMENT	How does that look?
SUGGEST	June 13th through 17th
REJECT	No, Friday I'm booked all day
ACCEPT	Saturday sounds fine
REQUEST-SUGGEST	What is a good day of the week for you?
INITIATE	I wanted to make an appointment with you
GIVE_REASON	Because I have meetings all afternoon
FEEDBACK	Okay
DELIBERATE	Let me check my calendar here
CONFIRM	Okay, that would be wonderful
CLARIFY	Okay, do you mean Tuesday the 23rd?

# + DAMSL (1997)

## Dialog Act Markup in Several Layers



- DAMSL distinguishes four dimensions according to the unit's purpose and role in dialogue:
  - **Communicative status**: whether utterance is intelligible and whether it was successfully completed (uninterpretable, abandoned, self-talk)
  - **Information level**: abstract characterization of the semantic content
    - Task: utterances that advance the task
    - Task-management: utterances that discuss the problem solving process or experimental scenario
    - Communication management: conventional phrases that maintain contact, perception, and understanding during the communication process: greetings, closings, acknowledgements ("Okay", "uh-huh"), stalling for time ("Okay", "Let me see"), signals of speech repairs ("oops") or misunderstandings ("sorry?", "huh?")
    - Other-level
  - **Forward-looking function**: characterizes what effect an utterance has on subsequent dialogue and interaction
  - **Backward-looking function**: captures the way the current utterance is related to the previous dialogue

# + Forward looking (2006)



- Statement:
  - Asserts and other acts where the speaker makes a claim about the world (modified in Core et al., 1998 to also allow statements to be claims about the communication).
  
- Info-request:
  - Speaker requests Hearer (by just asking or in another, indirect way) to provide information.
  
- Influencing-addressee-future-action:
  - Speaker is suggesting potential action to Hearer, beyond answering a request for information.
  
- Committing-speaker-future-action:
  - Speaker is potentially committing himself to perform a future action.
  
- Conventional:
  - Opening or Closing, i.e. Speaker summons Hearer and/or starts the interaction, or Speaker closes the dialogue or is dismissing Hearer.

# + Backward looking (2006)



## ■ Agreement:

- Speaker is addressing a previous proposal, request, or claim, with the possibility of accepting or rejecting all or part of the proposal, request or claim; of withholding his attitude towards the proposal, request, or claim; or stating his attitude while being non-committal to the proposal., request, or claim.

## ■ Understanding:

- Utterances concerning the understanding between Speaker and Hearer, ranging from merely hearing the words to fully identifying intention.

## ■ Answer:

- Standard reaction of Speaker to an Info-request action by Hearer.

## ■ Information-relation:

- Tag which should capture how the content of this utterance relates to the content of its antecedent (still subject of further study).

# + A DAMSL Labeling

Label	Utterance
Assert	C1: ...I need to travel in May
Info-request, ack.	A1: And what day in May did you want to travel
Assert, answer	C2: OK, uh, I need to be there for a meeting that's from the 12th to the 15th
Info-request, ack.	A2: And your flying into what city?
Assert, answer	C3: Seattle
Info-request, ack.	A3: And what time would you like to leave Pittsburgh?
Check, hold	C: Uh hmm, I don't think there's many options for a nonstop.?
Accept, ack.	A: Right,
Assert	there's only three non-stops today
Info-request	A: What are they?
Assert, open-option	C: The first one leaves PGH at 10 am ...
Accept, ack.	A: I'll take the 5ish one ...
Check, ack.	C: On the 11th?

# + Automatic Interpretation of Dialogue Acts



- How do we automatically identify dialogue acts?
- Given an utterance:
  - Decide whether it is a QUESTION, STATEMENT, SUGGEST, or ACK
- Recognizing illocutionary force will be crucial to building a dialogue agent
- Perhaps we can just look at the form of the utterance to decide?

## + Can we just use the surface syntactic form?

- YES-NO-Q's have auxiliary-before-subject syntax:
  - Will breakfast be served on USAir 1557?
- STATEMENTS have declarative syntax:
  - I don't care about lunch
- COMMAND's have imperative syntax:
  - Show me flights from Milwaukee to Orlando on Thursday night

	Locutionary Force	Illocutionary Force
Can I have the rest of your sandwich?	Question	Request
I want the rest of your sandwich	Declarative	Request
Give me your sandwich!	Imperative	Request

# + Dialogue Act ambiguity



- Can you give me a list of the flights from Atlanta to Boston?
  - This looks like an INFO-REQUEST.
  - If so, the answer is:
    - YES.
  - But really it's a DIRECTIVE or REQUEST, a polite form of:
    - Please give me a list of the flights...
- What looks like a QUESTION can be a REQUEST



# + Grounding



- Why do elevator buttons light up?
- Clark (1996) (after Norman 1988)
  - *Principle of closure*. Agents performing an action require evidence, sufficient for current purposes, that they have succeeded in performing it
- Need to know whether an action succeeded *or failed*
- Dialogue is also an action
  - a **collective action** performed by speaker and hearer
  - **Common ground**: set of things mutually believed by both speaker and hearer
- Need to achieve common ground, so hearer must **ground** or **acknowledge** speaker's utterance.

# + How do speakers ground?

Clark and Schaefer



- Continued attention:
  - B continues attending to A
- Relevant next contribution:
  - B starts in on next relevant contribution
- Acknowledgement:
  - B nods or says continuer like *uh-huh*, *yeah*, assessment (*great!*)
- Demonstration:
  - B demonstrates understanding A by paraphrasing or reformulating A's contribution, or by collaboratively completing A's utterance
- Display:
  - B displays verbatim all or part of A's presentation

## + A human-human conversation



C: ...I need to travel in May

A: And what day in May did you want to travel

C: OK, uh, I need to be there for a meeting that's from the 12th to the 15th

A: And your flying into what city?

C: Seattle

A: And what time would you like to leave Pittsburgh?

C: Uh hmm, I don't think there's amny options for a nonstop.

A: Right, there's only three non-stops today

A: What are they?

.....

# + Grounding and Dialogue Systems



- Grounding is not just a tidbit about humans
- Is key to design of conversational agent
- Why?
  - HCI researchers find users of speech-based interfaces are confusing when system doesn't give them an explicit acknowledgement signal
  - Stifelman et al. (1993), Yankelovich et al. (1995)

# + Conversational Implicature



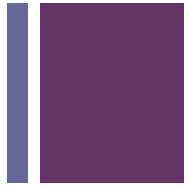
- **A: And, what day in May did you want to travel?**
- **C: OK, uh, I need to be there for a meeting that's from the 12th to the 15th.**
- Note that client did not answer question.
- Meaning of client's sentence:
  - Meeting
    - Start-of-meeting: 12th
    - End-of-meeting: 15th
  - Doesn't say anything about flying!!!!
- What is it that licenses agent to infer that client is mentioning this meeting so as to inform the agent of the travel dates?

## + Conversational Implicature (2)



- A: ... **there's 3 non-stops today.**
- This would still be true if 7 non-stops today.
- But no, the agent means: 3 and only 3.
- How can client infer that agent means:
  - *only 3*

# + Grice: conversational implicature



- Implicature means a particular class of licensed inferences.
- Grice (1975) proposed that what enables hearers to draw correct inferences is:
  - Cooperative Principle
    - This is a tacit agreement by speakers and listeners to cooperate in communication

## + 4 Gricean Maxims



- Relevance: Be relevant
- Quantity: Do not make your contribution more or less informative than required
- Quality: try to make your contribution one that is true (don't say things that are false or for which you lack adequate evidence)
- Manner: Avoid ambiguity and obscurity; be brief and orderly



# + Relevance



- A: Is Regina here?
- B: Her car is outside.
- Implication: yes
  - Hearer thinks:
    - Why mention the car?
    - It must be relevant.
    - How could it be relevant?
    - It could since: if her car is here she is probably here.
- Client: I need to be there for a meeting that's from the 12th to the 15th
  - Hearer thinks:
    - Speaker is following maxims, would only have mentioned meeting if it was relevant. How could meeting be relevant?
    - If client meant me to understand that he had to depart in time for the mtg.

# + Quantity



- A: How much money do you have on you?
- B: I have 5 dollars
  - Implication: not 6 dollars
- Similarly, 3 non stops can't mean 7 non-stops
  - Hearer thinks:
    - If speaker meant 7 non-stops she would have said 7 non-stops
- A: Did you do the reading for today's class?
- B: I intended to
  - Implication: No
  - B's answer would be true if B intended to do the reading AND did the reading, but would then violate maxim

# + Grice Incorporated



Laila Dybkjær, Niels Ole Bernsen and Hans Dybkjær

Centre for Cognitive Science, Roskilde University, Denmark

- Conducted Wizard of Oz study (WoZ) and analyzed “Cooperativeness” then compared the principles they observed with Grice’s maxims
- Group 1: Informativeness
  - Make your contribution as informative as is required (for the current purposes of the exchange).
  - Be fully explicit in communicating to users the commitments they have made.
  - Provide feedback on each piece of information provided by the user.
  - Do not make your contribution more informative than is required.

# + Grice Incorporated



## ■ Group 2: Truth and evidence

- Do not say what you believe to be false.
- Do not say that for which you lack adequate evidence.

## ■ Group 3: Relevance

- \*Be relevant, i.e. Be appropriate to the immediate needs at each stage of the transaction.

## ■ Group 4 Manner

- Provide same formulation of the same question (or address) to users everywhere in the system's dialogue turns.
- Be brief (avoid unnecessary prolixity).
- Be orderly.

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## ■ Group 5 Partner asymmetry

- Inform the dialogue partners of important non-normal characteristics which they should take into account in order to behave cooperatively in dialogue.
- Provide clear and comprehensible communication of what the system can and cannot do.
- Provide clear and sufficient instructions to users on how to interact with the system.

## ■ Group 6: Background knowledge

- Take partners' relevant background knowledge into account.
- Take into account possible (and possibly erroneous) user inferences by analogy from related task domains.
- Separate whenever possible between the needs of novice and expert users (user-adaptive dialogue).
- Take into account legitimate partner expectations as to your own background knowledge.
- Provide sufficient task domain knowledge and inference.

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## ■ Group 7: Repair and Clarification

- Initiate repair or clarification meta-communication in case of communication failure.
- Provide ability to initiate repair if system understanding has failed.
- Initiate clarification meta-communication in case of inconsistent user input.
- Initiate clarification meta-communication