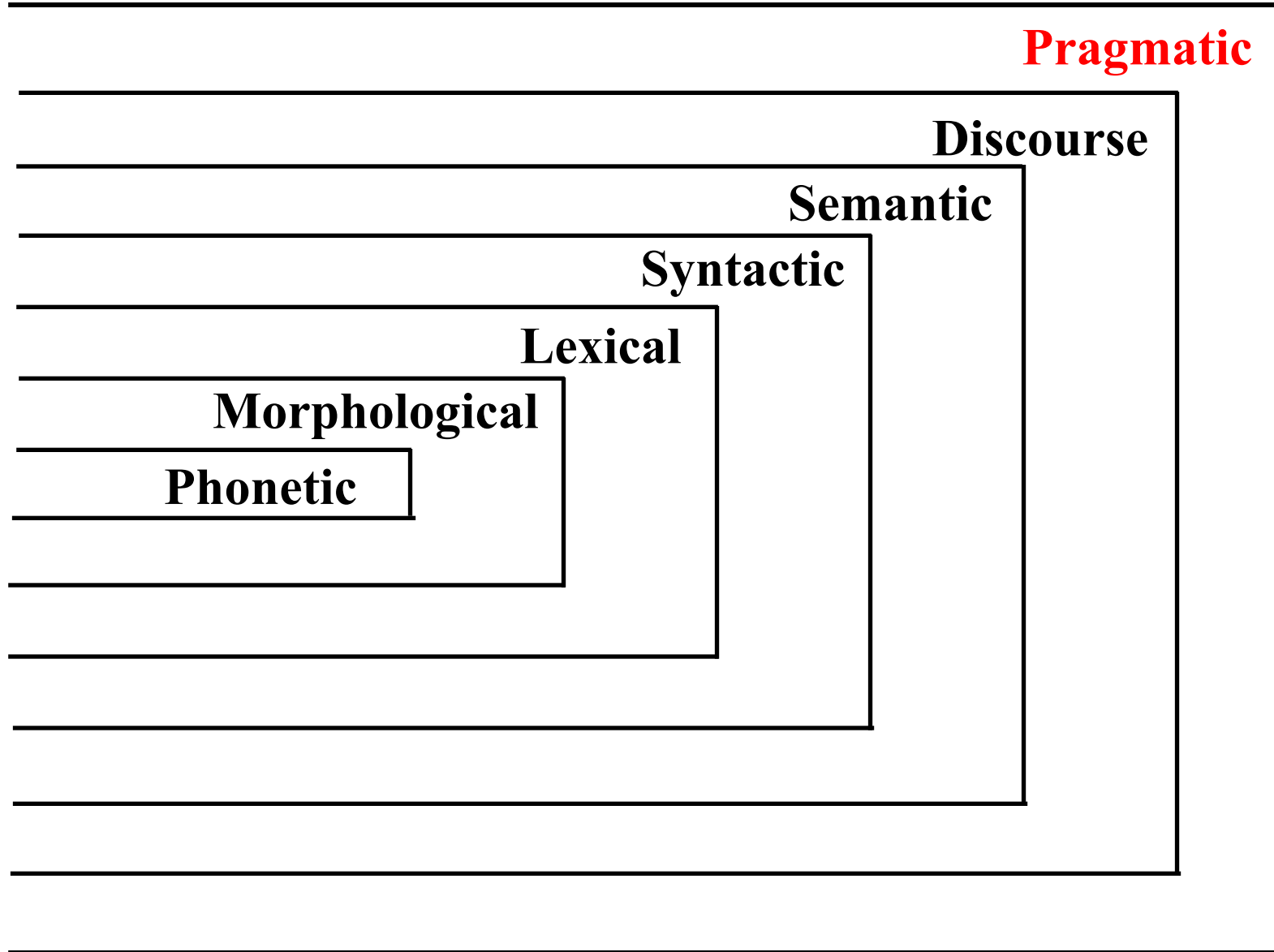


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# Pragmatics Level Dialogue Analysis



# Synchronic Model of Language



# PRAGMATICS

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- Functional perspective - The study of language in use
- Generally, aspects of language which require context to be understood
  - How the situational context is grammaticalized
  - World knowledge (knowledge bases) used for understanding
    - Useful pragmatics for semantic understanding of any text
- **One specific goal is to explain how extra meaning is read into utterance without actually being encoded in them**
- Relative emphasis:
  - More research interest in oral text than written text
  - Then, focus on dialogue rather than monologue
  - Of prime interest to natural language generation and human-computer interaction researchers

# Topics in Dialogues

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- Properties of Human Conversations
  - Speech Act Theory
  - Conversational Structure
  - Gricean Maxims
  - Dialogue Act Theory
- Computational Tasks
  - Using either transcripts of oral conversations or on-line written conversations, even chat
  - Recognition of Dialogue Acts
  - Plan Recognition

# Speech Act Theory

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- Proposed by John Austin in 1962 in *How To Do Things With Words*
- Systematized by John Searle in 1969 in *Speech Acts: An Essay in the Philosophy of Language*
- Communication succeeds only if the intention of the speaker is recognized by the listener
- Propositional content does not always fully communicate the speaker's intent
- Example:  
*I'm going to pay you back for that.*

# Speech Act Theory

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- Three Levels of Speech Acts:
- Perlocutionary – consequences of speech act
  - The (often intentional) production of certain effects upon the feelings, thoughts, or actions of the addressee in uttering a sentence
- Illocutionary – intention of speech act
  - The act of asking, answering, promising etc. in uttering a sentence
- Locutionary – proposition of speech act
  - The meaning of the sentence
- Example:

*You can't do that.*

  - Illocutionary force of protesting.
  - Perlocutionary effect of stopping someone from doing something.

# Speech Act Theory

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- **Examples of illocutionary acts:**

*"I'm telling you not to do that."* → a warning

*"I will help you tomorrow."* → a promise

*"I suggest you read that contract carefully."* →  
advice

*"I hereby inform you that you must pay your debt within 30 days."* → an informing act

# Taxonomy of Illocutionary Acts' Intents

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1. **Assertives** – commit the speaker to something's being the case – *suggest, swear, boast, conclude*
2. **Directives** – attempts by speaker to get listener to do something – *ask, order, request, invite, advise*
3. **Commissives** – obligate oneself to future course of action – *promise, plan, vow, oppose*
4. **Expressives** – share psychological state of speaker about something – *apologize, deplore, thank*
5. **Declarations** – bring about a different state of the world as a result of the utterance – *resign, baptize, marry*



# Conversational Structure

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- Conversation is a joint activity
- Overall organization of a conversation includes additional opening, closing, turn-taking
- Example: opening of telephone conversations have a 4-part structure
  - Stage 1: enter a conversation with a summons-response adjacency pair
  - Stage 2: identify speakers
  - Stage 3: establish joint willingness to converse
  - Stage 4: raise the first topic, usually done by the caller

# Turn-taking

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- Dialogue is characterized by taking turns: Speaker A says something, then Speaker B, etc.
- The dialogue itself is structured so as to allocate turns and to indicate to the next speaker when to start.
- Turn-taking rules: at each transition point,
  - If the current speaker has explicitly selected A as the next speaker, then A must go next
    - What do you think, Jessie?*
    - If A doesn't speak, it is “significant silence”, interpreted as a refusal to respond
  - If the current speaker hasn't explicitly selected a speaker, anyone can speak
  - If no one else takes the next turn, the current speaker may take it

# Conversational Implicatures

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- Grice, H.P. (1975). “*Logic and Conversation*”. Cole & Morgan (Eds). *Syntax & Semantics 3*.
  - Provide a principled explanation of how what is communicated is not necessarily what is said
- A set of over-riding conventions / maxims that are adhered to by both speakers and listeners
  - We all intuitively adhere to them without being aware of them
  - Pointing out the fact that conversation is co-operative
- Cooperative principle:
  - “Make your contribution as is required,  
at the stage at which it occurs, by the accepted purpose or direction of  
the talk exchange in which you are engaged.”

# Gricean maxims

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- Specify what participants in a conversation do in order to converse efficiently
  1. **The Maxim of Quality**
    - Make your contribution one that is true
      - Do not say what you believe to be false.
      - Do not say that for which you lack adequate evidence.
  2. **The Maxim of Quantity**
    - Make your contribution as informative as is required for the current purpose of the conversation.
    - Do not make your contribution more informative than is required.
  3. **The Maxim of Relevance** - make it relevant
  4. **The Maxim of Manner**
    - be clear, avoid obscurity, avoid ambiguity, be brief, be orderly

# Conversational Implicatures

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If speaker is observing the maxims directly, he will rely on listener to amplify what he is saying by some straightforward implicatures

Example:

A: Makes statement / asks question

B: Responds, but appears to fail to be co-operative

A: Assumes B is being co-operative; makes inferences in order to maintain assumption that B is being co-operative

These **inferences** are what have come to be known as “conversational implicatures”

# Conversational Implicatures

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## Four Gricean Maxims

- people don't always adhere to maxims

## Co-Operative Principle

- **But**, listeners interpret the speaker as being co-operative, making implicatures where necessary in order to continue this believe
- If speaker is observing maxims directly, he will rely on listener to amplify what he is saying by some straightforward implicatures

# Observing or Flouting Maxims?

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## Example 1

A asks B: *Would you like to go to a movie tonight?*

B responds: *I have to study for an exam.*

## Example 2

A: *Where's Bill?*

B: *There's a yellow VW outside Ann's house.*

## Example 3

A: *I've just run out of gas.*

B: *There's a garage around the corner.*

## Example 4

Tim: *Can I play cards with Pete?*

Mom: *How is your homework coming along, Tim?*

# Dialogue Act Theory

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- Attempts to explain not only the informative aspects of conversations, but the dialogue control aspects of an utterance
- Theory by Bunt (1994) lists the following (top-level) categories
  - Informative
    - Task-oriented: information seeking or providing
  - Dialogue control
    - Feedback: positive or negative
    - Discourse structuring: topic management, dialog delimitation
    - Interaction management:
      - Turn management
      - Time management
      - Own communication managements
      - Social obligations management: introduction, greeting, apology, thanking



# Dialog Acts in Transcribed Speech

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- Systems of dialog acts further developed by annotation of large amounts of transcribed speech (Stolcke et al 2000)
- Hand-labelled 1,155 conversations from transcribed telephone conversations
- Used the DAMSL tag set developed by Core and Allen (1997) of approximately 50 dialog act tags with 4 major groups
  - Statements and Opinions
    - Well, we have a cat ...*
    - Well, rabbits are darling ...*
  - Questions
    - Yes-No questions      *Do you have to have any training?*
    - Declarative question      *So you're taking a government course.*
    - Wh questions      *Who was that man?*

# Additional dialog act tags

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- Backchannels – any short utterance that plays a discourse structuring role, such as indicating that the speaker should continue
  - Uh, huh*
  - Um*
- Turn Exits and Abandoned Utterances
  - So*
- Answers and Agreements
  - Includes sub-tags of accept, reject, maybe, part
- And many other types, such as
  - Hedge *so I don't know*
- Look at example dialog and table of tags with frequency of occurrence in the Switchboard corpus
  - <http://acl.ldc.upenn.edu/J/J00/J00-3003.pdf>  
pages 340, 341

# Automatic detection of dialog tags

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- First task is utterance segmentation – unit of analysis in the corpus
  - Can be Sentences, Speaker Turns or shorter utterances
  - Techniques similar to sentence detection, rule-based or classification
- Labeling dialog tags
  - Can be modeled with HMMs to capture the sequence of speaker turns
    - Or a discourse grammar to model the sequence
  - Other types of automatic classification using features
    - Cue words and phrases for specific tags
    - All the words (Bag of words)
- Performance on the Switchboard corpus:
  - Accuracy: 65% using automatic recognition of words  
71% on text transcripts with corrected words
  - Human performance: 84%

# Dimensions of Dialog Tags

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- Difficult to model dialogs with the labeling of utterances with a single tag; many utterances have multiple functions in the dialog
  - DAMSL does allow multiple labels
- Other dimensional systems include Bunt's system in 2006, "Dimensions in Dialog Act Annotation"
  - Look at example in paper, page 922

# Types of dialogs

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- The Switchboard corpus is transcribed phone conversations
- Other types of transcribed conversations
- Text Conversations from on-line systems
  - Example of reference librarian system on next slide (from Keisuke Inoue)
- IM and other types of chat
  - Chat has the additional difficulty of utterance identification in that
    - utterances can be separated by speaker turn
    - Sequences of utterances can occur out of order
      - While B is typing a response to A, another comment from A arrives before the response is done

# DA Labels for online reference

*Question*  
*Clarifying Question*



ASK US!

You mean top fashion designers anywhere?

*Inform*  
*Info. Provision*



ASK US!

Calvin Klein Graduated from NY's Fashion Institute of Technology in 1964

*Inform*  
*Clarifying Question*



ASK US!

Do you have anyone in mind?

*Question, Inform*  
*Clarifying Question, URL Ref., Info. Provision*



ASK US!

How' bout Erica Tanov?  
<http://ericatanov.com/bio.htm>  
She graduated Parsons Design Institute, NY in 1985

(continue...)

*Question*  
*Initial Question*

Which colleges did top fashion designers go?

*Answer, Inform*  
*Pos. Ans., Additional Info. Spec*

Yep, anywhere in U.S.

*Inform*  
*Neg. Feedback*

I need more recent ones...

*Answer, Inform*  
*Neg. Answer, User Context/Purpose*

No... I'm deciding which school to go.

*Answer, Inform*  
*Pos. Feedback / Info. Request*

Ok, I need more schools...



# Reference Librarian online dialogue

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- Dialogues manually annotated for (multiple) dialogue acts
- Separated dialogue into segments, where each segment is labeled with the dimension and the more specific function

Thank you very much for using the service.

Social Rel. Mgmt / Gratitude

Please come again.

Social Rel. Mgmt / Rapport Building

Bye!

Social Rel. Mgmt / Valediction

# Results of automatic detection

- Machine Learning compares
  - classification using Support Vector Machines (SVM)
  - with sequential classification of Hidden Markov SVM (HM-SVM)
  - to see importance of sequence of dialog acts in learning
- Compares features as well, showing following results:

	Setup	TP Rate	FP Rate	Precision	Recall	F-Measure
S-16	SVM + word vector	0.4434	0.0514	0.5315	0.4434	0.4138
H-16	HM-SVM + word vector	0.6909	0.0576	0.6881	0.6909	0.6674
H-17	H-16 + sequence number	0.6815	0.0548	0.6741	0.6815	0.6604
H-18	H-16 + speaker	0.7046	0.0564	0.7176	0.7046	0.6826
H-20	H-16 + message length	0.6836	0.0555	0.6856	0.6836	0.6608
H-24	H-16 + message position	0.6946	0.0510	0.6797	0.6946	0.6722
H-48	H-16 + bigram vector	0.7185	0.0523	0.7189	0.7185	0.6996
H-58	16,18,24,48	0.7400	0.0461	0.7379	0.7400	0.7272



# Planning

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- How is it that we as humans understand what another person means?
- How do we understand an utterance which, on the surface means one thing, but clearly means another in our daily life?
- Based on the situation, we recognize their plan!
- Important in:
  - Conversational agents
  - Processing transcripts
  - Natural language generation

# Planning: Intro (Cont' d)

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- Unhelpful system responses:
  - 2a. User: *Do you know when the train leaves for Boston?*
  - 2b. System: *Yes.*
  
  - 3a. User: *Does the train for Washington leave at 4:00?*
  - 3b. System: *No.*
- System has made use of surface-level syntax and semantics to understand the user's questions, but no pragmatic knowledge

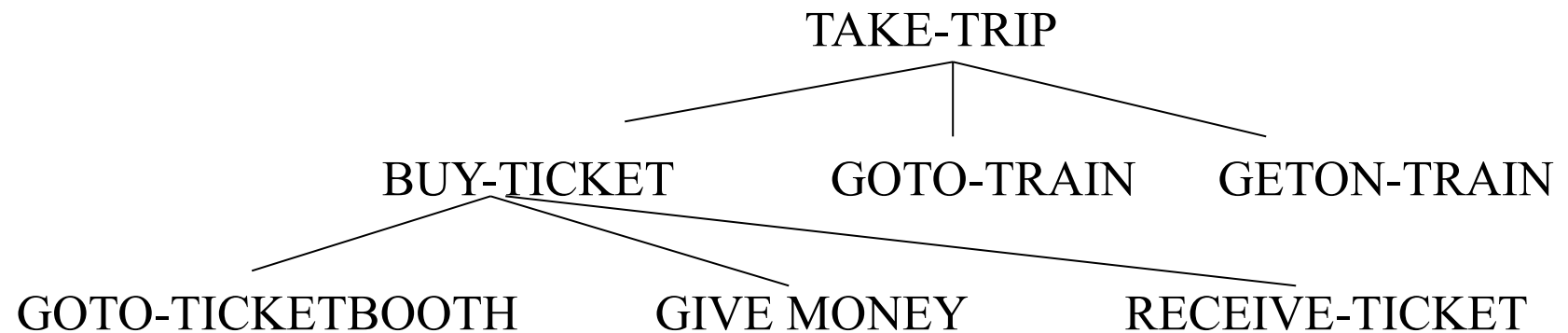
# Planning: Intro (Cont' d)

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- Surface level syntax and semantics is not enough
  - System needs to understand purpose / plan which motivated these utterances
- Helpful system response:
  - 4a. User: *The 3:15 train to Detroit?*
  - 4b. System: *Gate 10.*
  - 4c. System: *It's going to be 10 minutes late.*

# Trip-Taking Planning

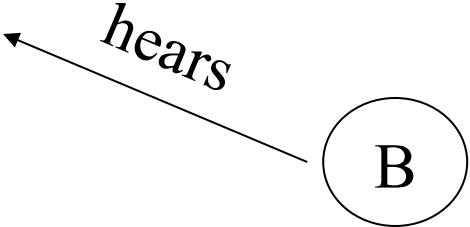
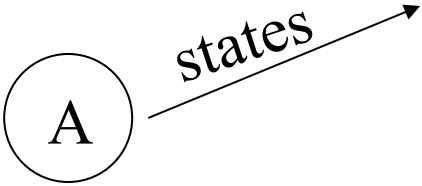
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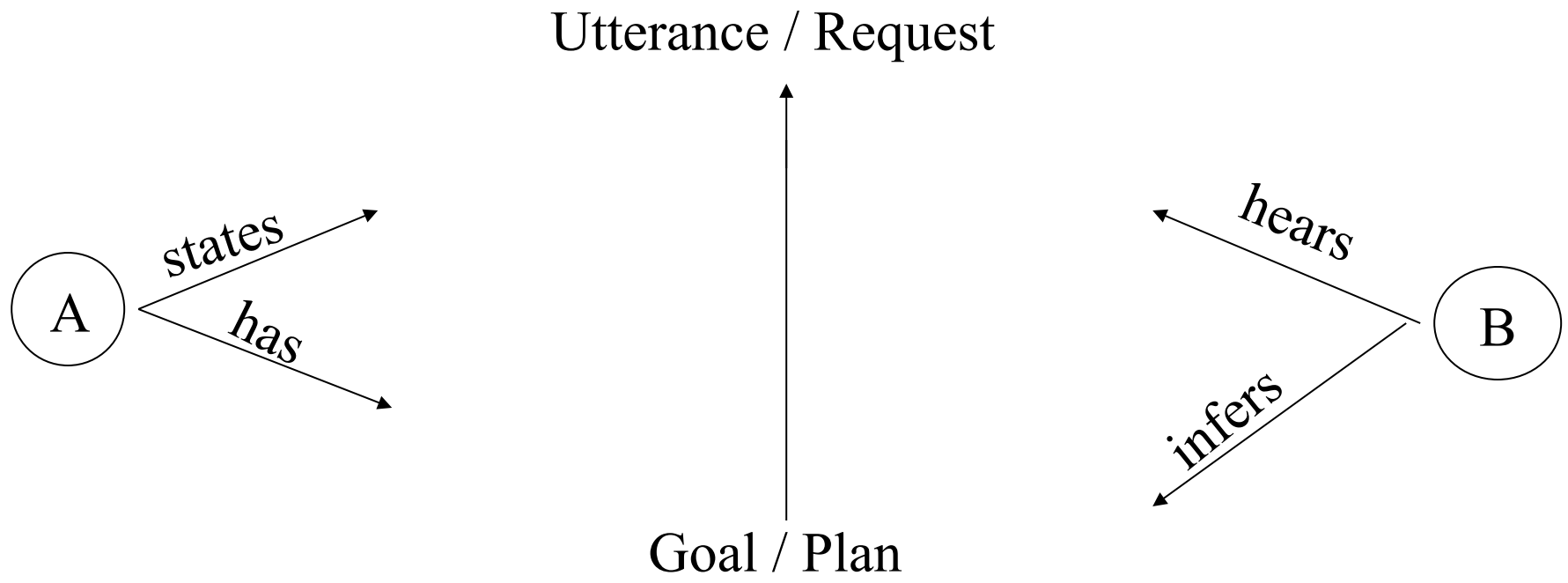


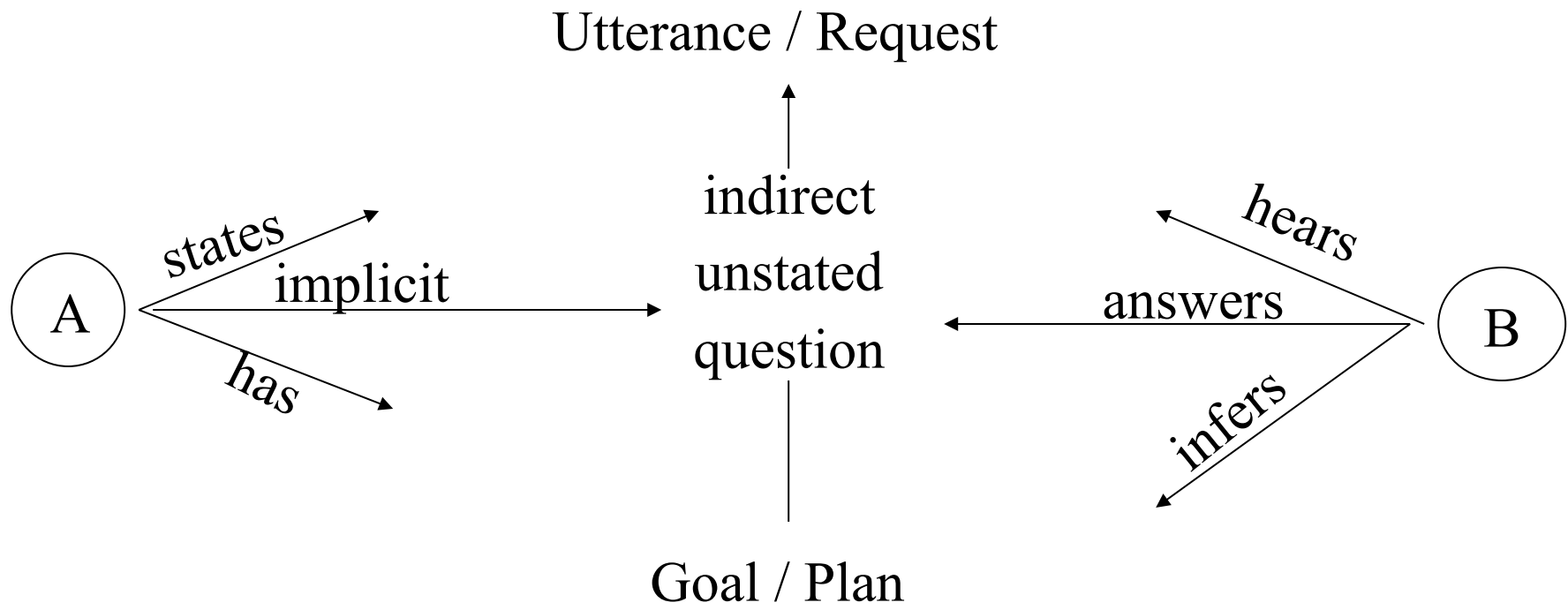
**Sketch of a commonsense task plan to take a trip**



Utterance / Request







# Conversational Agents

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- In addition to dialog understanding, dialogs may be used as the basis of systems that interact with humans through dialog
  - Airline reservation system example in Jurafsky and Martin
- Involves
  - Dialog understanding to process user's utterances
  - Plan analysis
  - Keeping track of the information state
  - Dialog generation to make responses to the user
- Current proliferation of “chat-bot” software
  - From Eliza to Siri



# Summary

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- Properties of Human Conversations
  - Speech Act Theory introduces “illocutionary” acts for the intent of the speaker’s utterance
  - Conversational Structure identifies turn-taking and other forms of conversation
  - Gricean Maxims give the “cooperative principle” where we infer the speaker’s meaning
  - Dialogue Act Theory identifies more detailed conversational structures
- Computational Tasks
  - Automatic recognition of Dialogue Acts
  - Plan Recognition contributes to the organization of conversational agents