Pragmatics Level
Dialogue Analysis

Synchronic Model of Language

Pragmatic

Discourse

Semantic

Syntactic

Lexical

Morphological

Phonetic
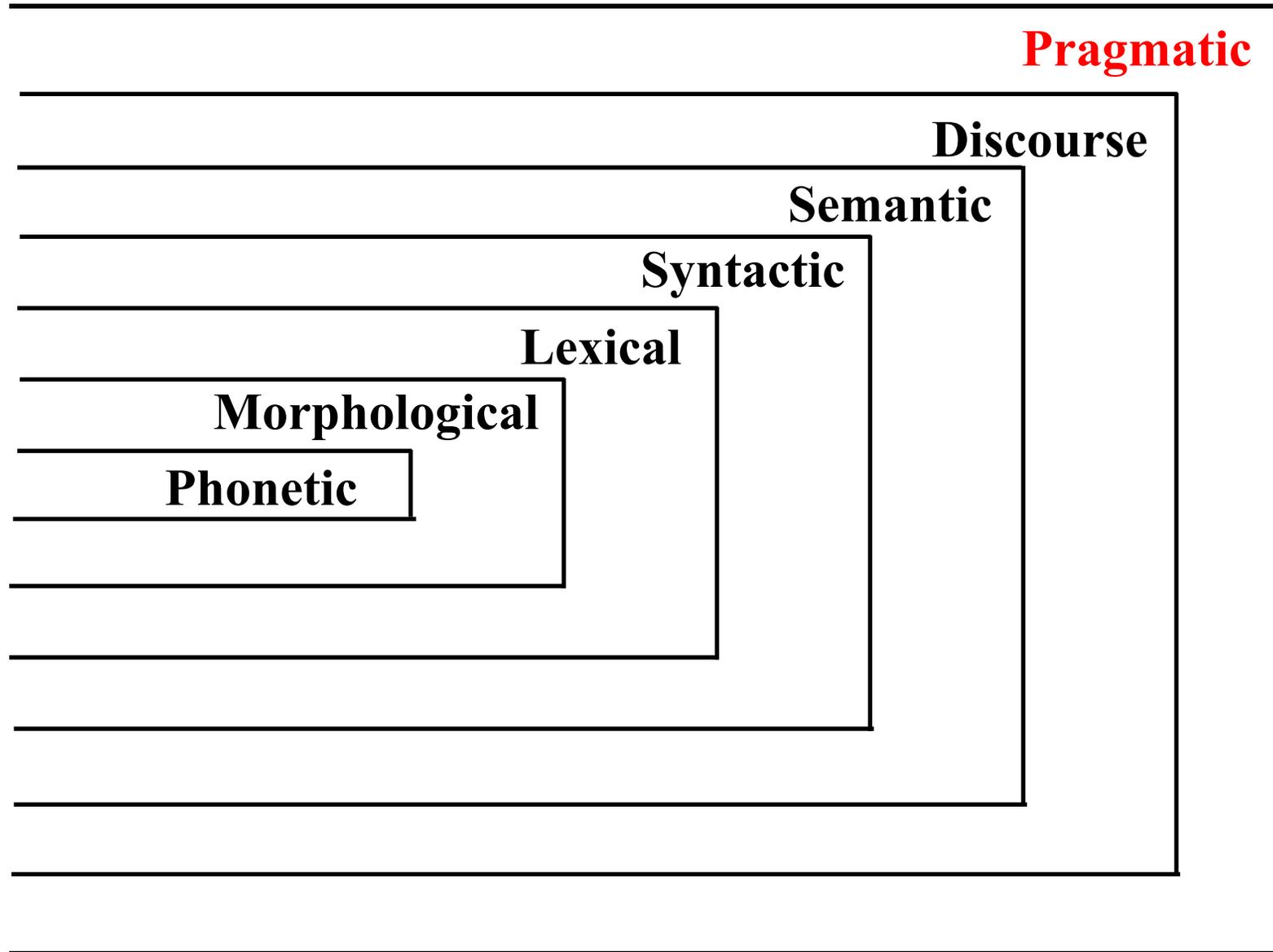
PRAGMATICS

- 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

- 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

- 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

- 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

- **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

Speech Act Theory

- **Examples of perlocutionary acts:**

  "By the power invested in me, I now   pronounce you man and wife."

  "I baptize you John Michael."

  "I christen this ship, USS Constitution."

Taxonomy of Illocutionary Acts' Intents

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

- 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 adjency 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

- 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

- 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

- 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

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

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?

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

- Attempts to explain not only the informative aspects of conversations, but the dialogue control aspects
- 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 delimination
    - Interaction management:
      - Turn management
      - Time management
      - Own communication managements
      - Social obligations management: introduction, greeting, apology, thanking

Dialog Acts in Transcribed Speech

- 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

- 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

Automatic detection of dialog tags

- 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

- 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

Types of dialogs

- 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

Question
Clarifying Question

Question
Initial Question

Which colleges did top fashion designers go?

You mean top fashion designers anywhere?

?
ASK US!

Inform
Info. Provision

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

Yep, anywhere in U.S.

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

?
ASK US!

Inform
Clarifying Question

Inform
Neg. Feedback

I need more recent ones…

Do you have anyone in mind?

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

Answer, Inform
Neg. Answer, User Context/Purpose

No… I'm deciding which school to go.

?
ASK US!

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

?
ASK US!

Answer, Inform
Pos. Feedback / Info. Request

Ok, I need more schools…

(continue…)

Planning

- 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?

- We recognize their plan!

- Important in:
  - processing transcripts
  - Natural language generation

Planning: Intro (Cont'd)

- 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
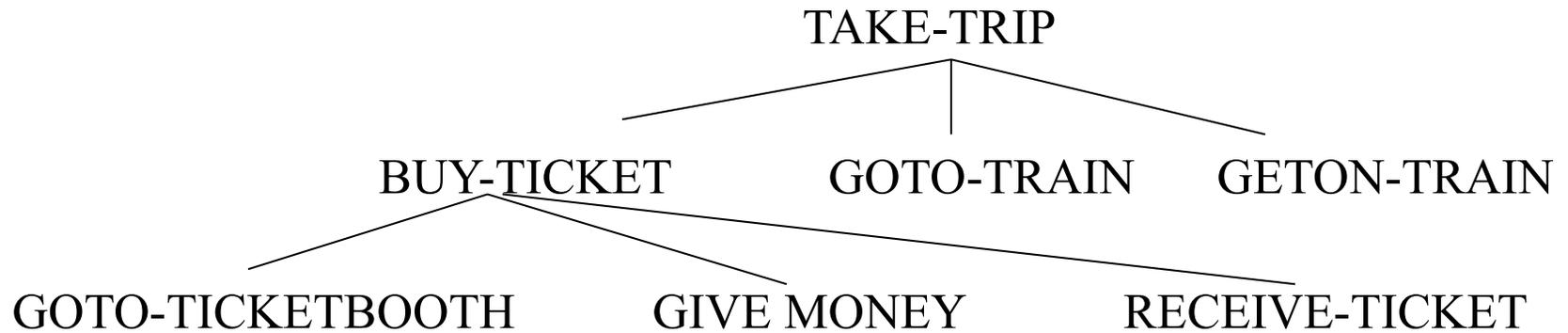
Planning: Intro (Cont'd)

- ## 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.*

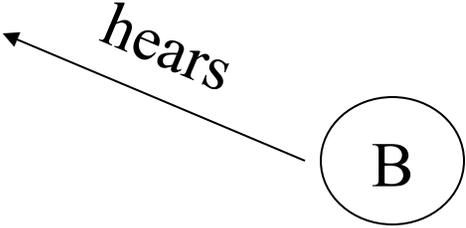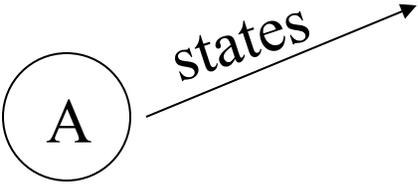 4c. System: *It's going to be 10 minutes late.*

Trip-Taking Planning
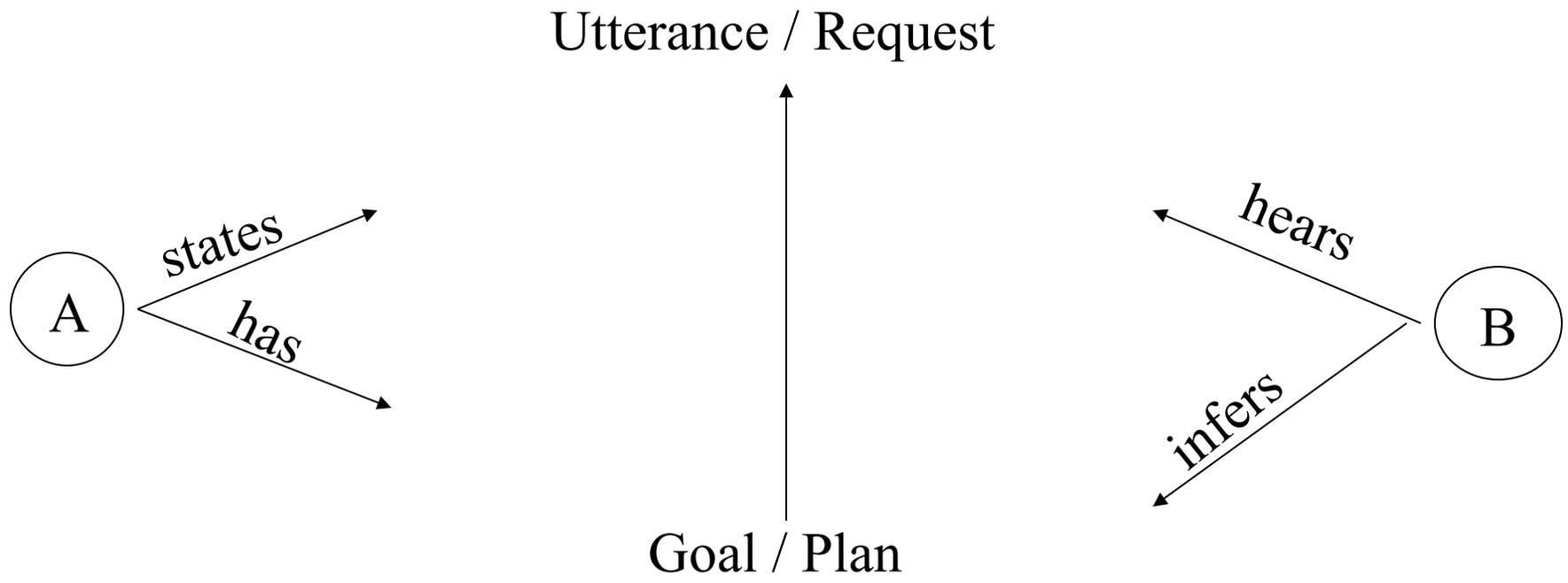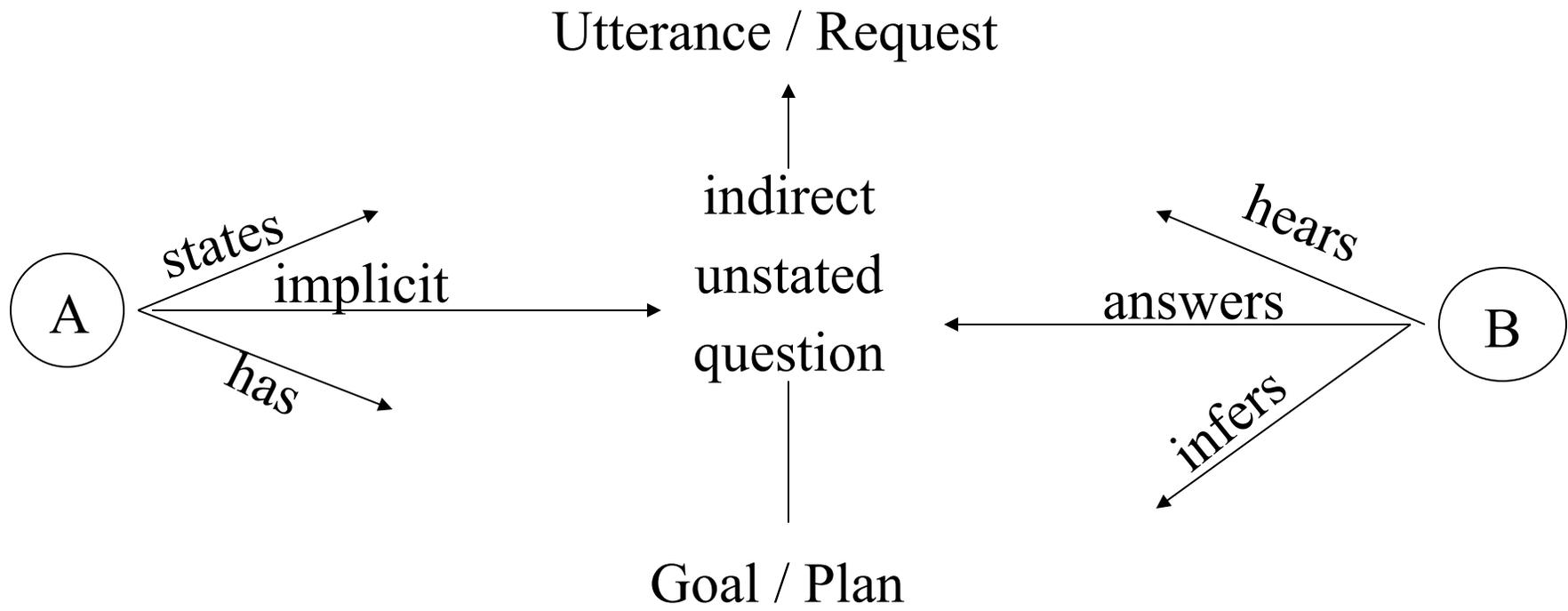
TAKE-TRIP

BUY-TICKET   GOTO-TRAIN   GETON-TRAIN

GOTO-TICKETBOOTH   GIVE MONEY   RECEIVE-TICKET

Sketch of a commonsense task plan to take a trip

Utterance / Request

A —states→   ←hears— B

Utterance / Request

A states

has

hears

infers

B

Goal / Plan

Utterance / Request

A — states / implicit / has → indirect unstated question ← answers / hears / infers — B

Goal / Plan

Conversational Agents

- 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 under user's utterances
  - Plan analysis
  - Keeping track of the information state
  - Dialog generation to make responses to the user