Generation

- The process of building a text natural language in order to achieve specific communicative goals (Mann,82)

Applications

- Which type of applications include generation of natural language sentences?
  - Sophisticated Question/Answering Systems, such as Learning Systems and interfaces to complex knowledge-based applications.
  - Consulting information systems (i.e., telephonic systems giving information about train schedules)
  - Systems that generate summaries, reports and personailzed letters.
  - Translation Systems

Generation

- There are two main tasks
  - Content selection: what has to be said
    - Belongs to the discourse plan
  - Superficial realization: how has to be said
    - Presenting content correctly

Content Selection

- Identifying the communicative goals: the information that has to be communicated.
- The text organization. Specifying how the communicative goals have to be achieve considering:
  - The user
  - Terminology
  - Level of specifity
  - Quantity of information

Content Selection

- Determine the content of the system sentences in order to achieve the goals
- Examples:
  - *Madagascar is not shown in Sant Cugat [Nucleus]*
    - *It is shown in Barcelona [Satellite]*
  - *Would you like a suite? [Nucleus]*
    - *It is the same price than the doble room [Satellite]*
  - *Magic Flaute is not shown this year at Liceu [Nucleus]*
    - *But Figaro Wedding is [Satellite]*

Content Selection

- Using content
  - Obtained from user interventions and other sources (database,etc)
  - Selecting, adapting, combining these infromation

. Two approaches
  - Schema-based
  - Based on planification

Content Selection

- Schema-based
  - A schema is a pattern that specifiies how a text can be built using smaller parts of texts

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Inform-Next-Train-Schema →
    Sequence(  Message:NUMBER-OF-TRAINS-IN-PERIOD,
               Next-Train-Information-Schema)

Next-Train-Information-Schema →
    Elaboration(Message:IDENTITY,
               Message:DEPARTURE)
```

Content Selection

Systems based on planification

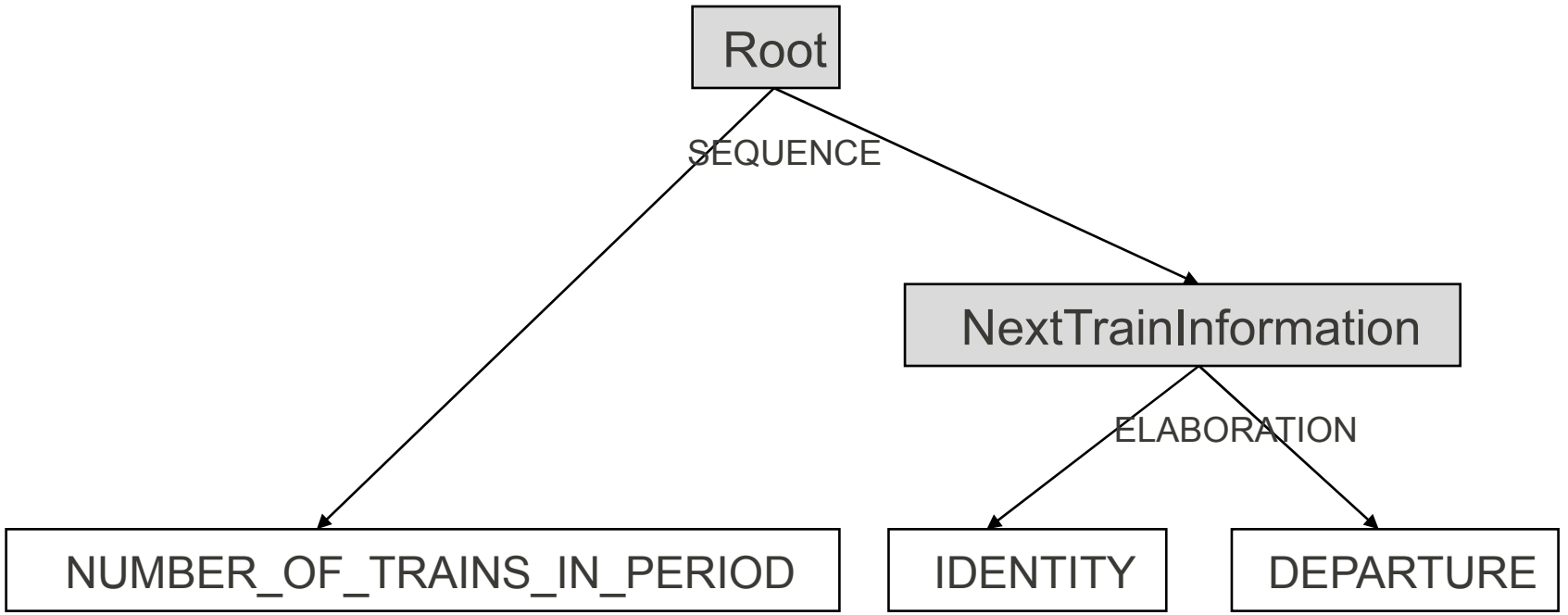
Several types of planification systems

- Discourse planning
- Sentence planning

- Example of system using this approach:
  - The one developed by Litman:
  - It uses two planification systems: one adapted to the domain and one adapted to the discourse

Content Selection

Discourse Planning
Structure and order of the messages to communicate
Exemple of the Discourse Structure Tree (Reiter, Dale)



User Model

- Different Types
  - Static (previous clasification of the user)
  - Dynamic (during the dialogue the classification of the user changes)
- Walster & Kobsa:
  - Default reasoning from stereotypes.
  - Initial models from previous sessions.
  - Direct inferences from user's expressions.
  - Indirect inferences from user's expressions.

Content selection (Research)

- Knowledge Bases
  - Domain knowledge
  - User believes
  - User model: preferences, language.
  - Dialogue history
- Mechanisms for content selection
  - Schemes - patterns
    - First object name, then attributes
  - Rules
  - Plans
  - Reasoning

Content selection (Real systems)

- Knowledge sources
  - Domain knowledge
  - Dialogue history
- Strategies pre-defined for content selection
  - Only nucleus, not satellite
  - Nucleus + satellite fixed

Superficial realization

- Goal: to determine **how** content selected is presented
- Examples:

  Madagascar is shown at CINESA cinema in Sant Cugat

Superficial realization

Tasks

- Lexical selection
- Construction of phrases, sentences, paragraphs
- Presentation order

Perkins, 89 Classification of attributes

- Patterns for questions, answers, negations,...
  - *what is the length of block A in meters*
  - *the length of block A is 27 meters*
  - *the length of block A is not 27 meters*
  - *the length of block A is unknown*
- 16 types of attributes
  - of, who_of, of_value, is, is_value, is_verb_value, does, who_does, what_does, has, has_value, object, who_object, split, can, how_well_can

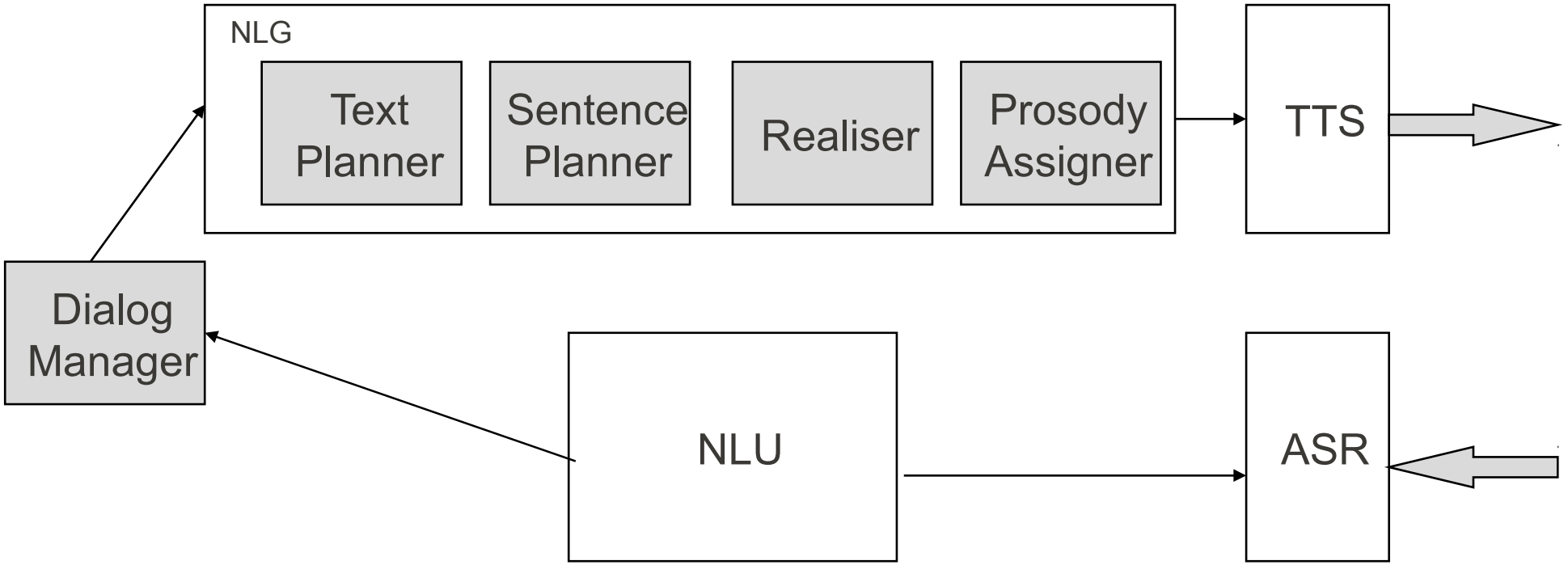
Superficial realization (Research)

- The generator input is
  - Semantic representation
  - Phrase structures
- The generator uses a grammar and a lexicon for generating the sentence

Superficial realization (Real systems)

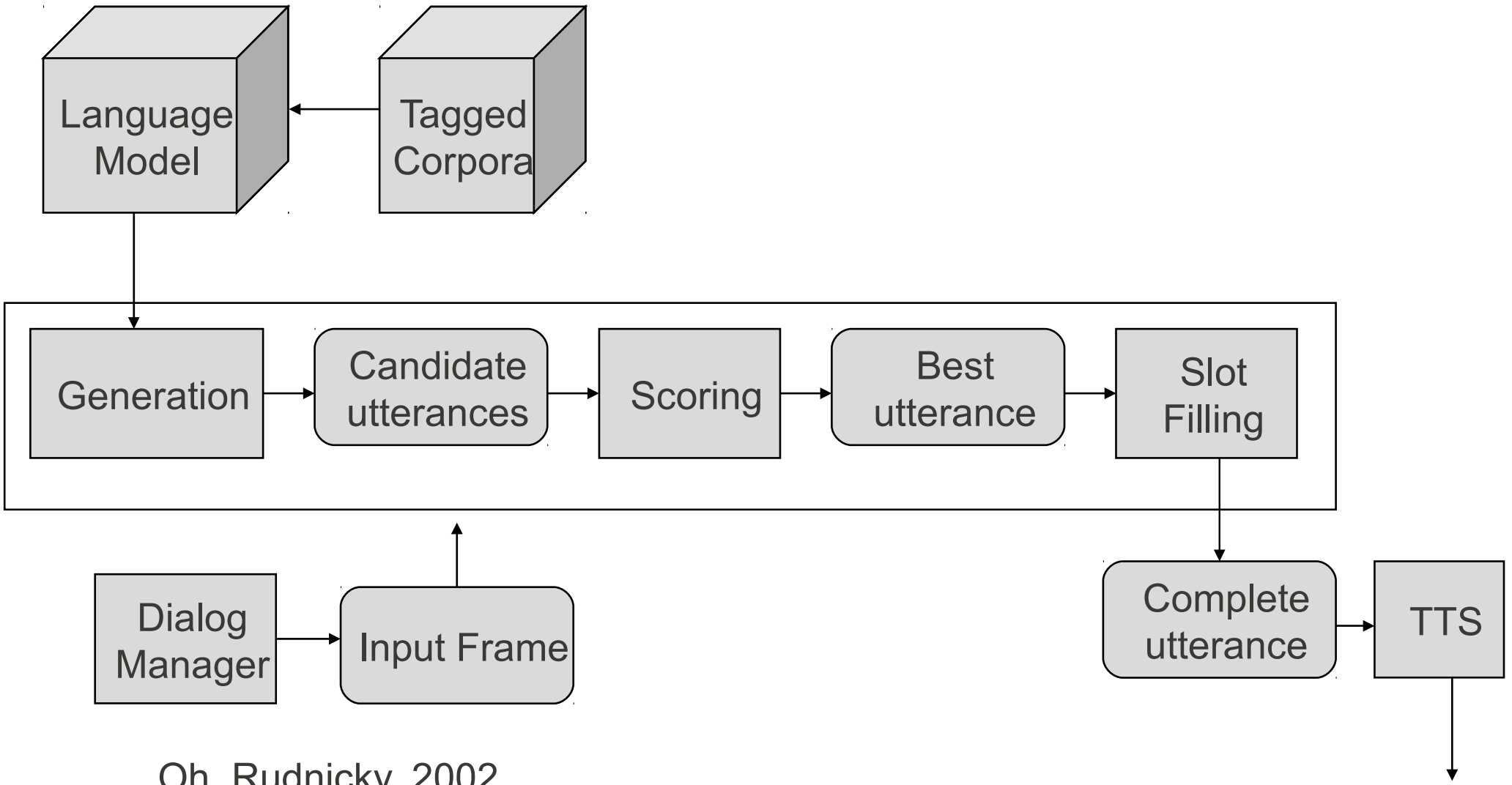
- Predefined (canned) sentences
  - Sentences to achieve specific goals
    - Initial and final sentences
    - Ask the user to repeat
  - Specially appropriate for speech
- Patterns
  - Patterns for goals
    - Notification: You have been assigned number X.
    - Information: A,B,C,D, and E are shown at cinema F.
    - Clarification: Did you said X or Y?

NLG in Dialogue Systems



Rambow et al, 2002

An Stocastic NLG



Oh, Rudnicky, 2002

References

- Reiter, Dale, 1995
- Reports del proyecto RAGS
- M. Walker, O. Rambow, S. Bangalore, ...
- A. Oh, A. Rudnicky, 2002