DISCOURSE AND DIALOG

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“ Discourse is the word used in NLP to refer to aggregated forms of language. The phrase includes both oral communication among several individuals or artificial entities as well as written language, such as storytelling. We refer to these lengthy conversations as dialog when there are numerous persons involved in interactive communication. ”

MODELS OF DISCOURSE

Discourse has a surface structure as well as an intentional purpose.

- discourse structure contains both a linear and a hierarchical structure of elements, which we often refer to as a tree in computer science.
- Discourse is divided into recognizable pieces that are either related to dialog management (starting, finish) or content (themes and subtopics).
- Processing this structure may be accomplished using a stack, which is a computational abstraction.
- Topics are pushed when they are introduced and popped when they are finished. (A tree's parent-child connections are reflected in the push-pop sequences.)

Discourse Relations

- Discourse relations are binary relationships that exist between phrases that are next to one another or between a clause and a more comprehensive coherent unit based on the semantics of the expressions themselves (as opposed to the author's intended meanings).
- An implicit or explicit discourse connective that identifies the sort of semantic relationship that exists between the two sections connects the components of the binary relation.

Discourse Relations

- Words like "so" and "because" that have lexical meanings that specify the kind of discourse connection (such as "explanation" or "justification") are examples of discourse connectives.
- Normally, the two linked phrases are whole sentences, but one of them may be a complicated noun phrase deriving from a clause, like "the occurrence of a pandemic," which is deriving from "a pandemic occurred." Such derived noun phrases are referred to as "nominalizations".

Table : Example of discourse Relations

Example	Discourse Type
She hasn't played any music since the earthquake hit.	Temporal.Succession
She was originally considered to be at high risk due to the familial occurrence of breast and other types of cancer.	Cause.Reason

Rhetorical Relations

“ Rhetorical relations are binary relationships that exist between language phrases but go beyond the meaning of those utterances. ”

Discourse Representation Theory(DRT)

DRT structures are made up of two main components:

- a set of discourse referents that represent the things being discussed and
- a set of propositions that record the details that have been provided about those things, such as their type, their properties, and any events or states that would apply to them.

MODELS OF DIALOG

In dialog, there multiple presumed speakers or participants :

- primary turn :The primary turn creates a context in which the dependent turn must fit.
- dependent : dependency is that the speaker who makes the primary turn has control or initiative.

Grounding

“ The process of exchanging evidence of the success of dialog is called **grounding**. “

Turn taking and Grounding

“Turn taking is the process by which participants in a multi-party spoken conversation determine whose turn it is. They do this by combining content (what they say) and time (how long they stop after speaking).”

Grounding Types

Grounding type	Example of a turn (A) and a reply (B) with grounding
Continued attention	
Relevant next contribution	A: How are you? **B: I am fine thank you.**
Acknowledgement	A: I'd like a small burger. **B: Okay. Would you like fries with that?**
Demonstration	A I'd like a small burger. **B: You want to order a hamburger. Anything else?**
Display	A. I'd like a small burger. **B: a small burger...**
Display+Demonstration	A. I'd like a small burger. **B: a small burger, and besides the burger, anything else in your order today?**

Mixed-Initiative Dialog and the Turing Test

- Mixed-initiative has been the ideal for human-machine interaction. Telephony systems come close to mixed initiative (and they call it that) by allowing users to specify more than one field value per prompt, rather than requiring them to explicitly follow one prompt per field.

- The Loebner prize, which is based on the Turing Test, is one of several initiatives to spur advancement.

Frameworks for Implementing Dialog Systems

- *Rule-based chatbot libraries*
- *VoiceXML-based frameworks*
- *Commercial ML based chatbot toolkits*

Rule-based chatbot libraries

- Rule-based chat systems, such as found in the NLTK chat package, “perform simple pattern matching on sentences typed by users, and respond with automatically generated sentences”. This approach is similar to the one used for first chatbots, such as ELIZA.
- Patterns are specified using ad hoc code or regular expressions

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VoiceXML-based frameworks

```
<form>
 <field name="transporttype">
   <prompt>
     Please choose airline, hotel, or rental car.
   </prompt>
   <grammar type="application/x=nuance-gsl">
    [airline hotel "rental car"]
   </grammar>
 </field>
 <block>
  <prompt>
   You have chosen <value expr="transporttype">.
  </prompt>
 </block>
</form>
```

Sample VoiceXML Form

```
<field name="destination">
    <prompt>
        And which city do you want to go to?
    </prompt>
    <grammar type="application/x=nuance-gsl">
     [(san francisco) denver (new york)  barcelona]
    </grammar>
    <filled>
      <prompt>
         OK, to <value expr="destination">
      </prompt>
    </filled>
 </field>
 <field name="departdate" type="date">
    <prompt>
        And what date do you want to leave?
    </prompt>
    <filled>
      <prompt>
         OK, on <value expr="departdate">
      </prompt>
    </filled>
 </field>
```

Example of multiple VoiceXML fields

Commercial ML based chatbot toolkits

VoiceXML and software libraries both lack the flexibility that today's users want. A number of commercial software service providers, including Google, Amazon, Cisco, and Facebook, provide solutions for developing chatbots in order to overcome this constraint. Because the corporations want to use these chatbots with their own proprietary smart speakers and devices (like Siri, Amazon Alexa, Facebook Dialogflow, etc.), they are platform-specific. A developer must provide a set of "intents"—labels for various types of responses—in order to utilize these toolkits. Additionally, developers provide labelled training data along with the answer to go along with each label.

The Dialog Action Markup Language

- ***DiAML Syntax:*** *A functional segment, according to the DiAML dialog annotation standard, is the shortest span of behavior that has at least one full communicative function. Each of these segments may have many (potentially overlapping) semantic dimensions, making them the units that need to be annotated.*

Resources for DiAML

- There is a tool for annotating multimodal dialog in video data, called “ANVIL”.The creators of ANVIL provide small samples of annotated data to help illustrate the use of the tool.
- Switchboard Corpus that has been annotated with general types of dialog actions, including yes-no questions, statements, expressions of appreciation, etc, comprising 42 distinct types overall. The corpus contains 1,155 five-minute telephone conversations between two participants, where callers discuss one of a fixed set of predefined topics, including child care, recycling, and news media.

Ref:

https://uwm.pressbooks.pub/naturallanguage/chapter/discourse/

Thank You