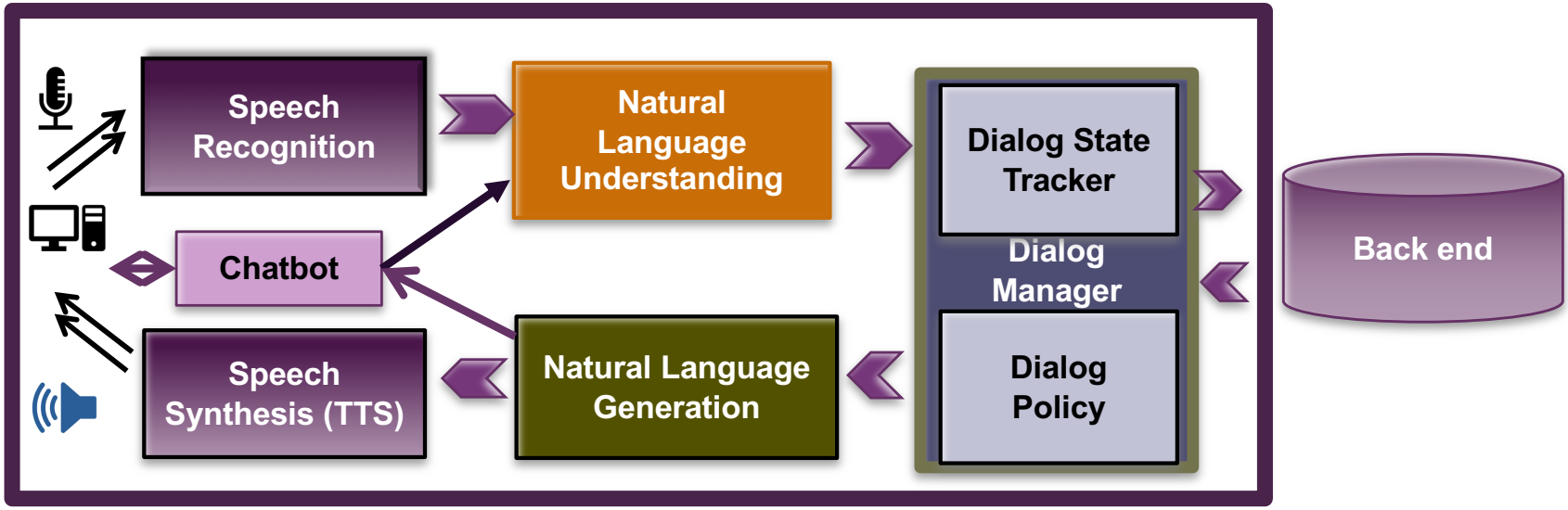
Dialog Systems

Dialogue System Architecture



- Dialog state: Where am I?
  - ”Meaning of current utterance
  - Context from
    - Previous utterances
    - User profile
    - Back end
- Dialog policy: What should I do?
  - Takes dialog state, backend results
  - Outputs what to send to the user

Characteristics of an "Advanced" Dialog System

- **Mixed initiative**
  - User can change the topic or revisit previous dialog elements
  - System can take control to get more clarifying information
  - User can say anything at any point and get some intelligent response
- **Multimodal**
  - Input and output can be audio/visual/tactile
  - Issue: processing the timing between speaking & gesturing
- **Helpful**
  - Offers additional information or incorporates multiple steps
  - Recognizes
- **"Self aware"**
  - System identifies the confidence of an interpretation
  - Knows when to ask for clarification and when to move forward
  - Knows when it's being asked something beyond the applications capability
- **Context aware**
  - "Remembers" what the user has already said and uses that information
  - Recognizes the users goals based on what has happened so far
  - Tracks the users "focus" so speakers can refer back to objects already mentioned
- **"Natural" interaction**, variability of expression

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+ Critical Element: Context

- Context aware
  - “Remembers” what the user has already said and uses that information
  - Tracks the users “focus” so speakers can refer back to objects already mentioned
  - Recognizes the users goals based on what has happened so far
  - Recognizes visual and gesture as contextual elements

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What does context give us?

- Narrow the search
  - Show me the restaurants near here.
  - Which ones are open?
- Gate the interpretation and constrain the interpretation
  - Can't add to an order if you haven't started one
- Pointing with words
  - The second one
  - The Indian one
- Tracking objects mentioned already
  - Reuse for new tasks
  - Going back to an unfinished task
- Track user goals to understand tasks in context
- Ability to "recover" when user is misunderstood or user changes his/her mind
  - Guide "clarification" dialogs

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Examples of where we want to go

- U: When am I speaking?
- S: 2 pm on Tuesday
- U: Put **that** on my schedule
- U: Is anyone from Sensory speaking?
- S: Yes. Jeff Rogers and **Todd Mozer**
- U: What is **Todd** speaking on?
- S: **He's** on the panel. Here's the description.
- S: Would you like that on your personal schedule?
- U: Thanks. **How about** Jeff?

Task:Query Time

Context aware: refer back to session (not the time)

External context: "my schedule" is a known object

Context aware: refer back to speaker mentioned

Multimodal

Helpful & mixed initiative

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Continued Examples

- U: **How about** Jeff?
- S: Jeff Rogers is speaking on Truly Handsfree **at 11 am on Tuesday**.
- U: (notices time) Do I have a session **scheduled** now?
- S: No, until 11 am.
- U: **OK**. What's in the **other** track?
- S: Here are the talks in the Business track at 11: <shows results>
- U: I'd like to hear **<Pat>.** Schedule me for **that one**.
- S: ?? **No "Pat" in that session**
  - Ask to repeat
  - Ask if user means Matt?
  - Ignore misreco and execute command
- S: It's 11 o'clock. Time for your next session, which is in Ballroom B

Context Aware

Helpful: Provide additional info

Context: Return to previous task

Discourse context "Other"

Self aware: Misrecognition

Make choices

Mixed Initiative, helpful

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What's in the "Discourse Manager" box?

- Context created by the discourse so far
  - Allows "abbreviated" sentences
    - How much do I owe **[on my visa bill]**
- Expectation of what might happen next
  - Task representation with sequences of events (Agenda)
  - Proactively offer of next steps
- Knowledge of the tasks the system is capable of
  - Connection of tasks to backend systems
  - Representation of what can't be done
- Knowledge of the input and output modalities and how they relate
  - Need to know what's in the list to act on "next one"

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