Using speech recognition for just-in-time language learning

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Contents of this talk

- **Background**: Language learning in an *informal* setting
- **Description** of a lexical entrainment dialogue system
- A **study** of lexical entrainment
Most CALL systems assume:

- A goal – skills to teach:
  - phonetics, vocabulary, grammar, etc.
  - speaking, listening, reading, etc.
- A fixed curriculum
- A fixed set of sessions or time period
- A test of the whole skill set
Background: language learning in an informal setting

- An informal setting:
  - A goal – set of skills to teach:
    - phonetics, vocabulary, grammar, etc.
    - speaking, listening, reading, etc.
  - A fixed curriculum
  - A fixed set of sessions or time period
  - A test of the whole skill set
Background: language learning in an informal setting

- Immersion
  - Authenticity: Can be used in real life
  - Fluency: from basic skills to fluent use

- Motivation (Mathan...)
  - Interesting content
  - Produces more robust learning
    - REAP project for reading
      - Choice of topic for documents
      - Group with choice more motivated and learned more
Background: language learning in an informal setting

- **“Just-in-time” learning**
  - Curricula created for specific immediate needs
    - Working on oil platform in the North Sea
    - Real need (efficient communication) > motivation
  - Small, focused, structured curriculum

- **Teachable moments**
  - Events encountered in curricula/media
    - Ogan: view French movies > culture, stop at moments
  - Curriculum is less structured
    - Driven by events in medium
Background: language learning in an informal setting

- Lexical entrainment (Brennan 96)
  - Speakers in a dialogue will adapt to one another
  - Affording ease of communication
- "Recasting"
  - Implicit pinpointing and correction
  - "I need a machine that shows pictures on a screen" > "You need a projector, for which room?"
Background: language learning in an informal setting

- **Lexical Entrainment**
  - Lyster 1998 study
    - Found recasting in general less effective than other strategies
      - Elicitation or clarification requests
    - Recasting is good for some items, not for others
    - Recasting effective for phonology and grammar
    - Recasting not effective for vocabulary
      - Follows Brennan’s observation that the first person to use a term will impose it on the other
      - “the funny yellow car” (yellow car)
Background: language learning in an informal setting

- So, what makes students learn more in an informal setting?
  - Authenticity
  - Motivation
    - Interest
    - Need
  - Timing
    - Appropriate context
    - Immediate use
A Lexical Entrainment Dialogue Strategy

- Uses the Ravenclaw/Olympus structure in the Let’s Go spoken dialogue system
  - Used for bus information
  - Olympus used for room reservations as well
- F0 unit selection (Raux, Black ASRU 2003) for emphasis in synthesis
Corrective Prompt Example

I want to go the airport

Did you mean:
I want to go TO the airport?

Background       Description       Study
Generation of Corrective Utterances

○ Create the content (text) of the utterance
  - Match the user utterance against a list of target “native” utterances

○ Apply a natural prosodic contour to emphasize erroneous words
Corrective prompt generation algorithm

I want to go the airport

Background Description Study
Corrective prompt generation algorithm

I’d like to go to the airport
I want to go the airport

Background

Description

Study
Corrective prompt generation algorithm

I’d like to go to the airport
I want to go the airport
I want to go to the airport

ASR Hypothesis → DP-based Alignment → Prompt Selection → Emphasis → Confirmation Prompt

Background Description Study
Corrective prompt generation algorithm

I’d like to go to the airport

I want to go the airport

I want to go to the airport

ASR Hypothesis → DP-based Alignment → Prompt Selection → Emphasis → Confirmation Prompt

Background  Description  Study

Target Prompts
Corrective prompt generation algorithm

Background

Description

Study

ASR Hypothesis

DP-based Alignment

Prompt Selection

Emphasis

Confirmation Prompt

Target Prompts

I’d like to go to the airport

I want to go to the airport

I want to go the airport
Corrective prompt generation algorithm

I’d like to go to the airport

I want to go the airport

Did you mean I want to go to the airport?

Background  Description  Study

ASR Hypothesis  DP-based Alignment  Prompt Selection  Emphasis  Confirmation Prompt

Target Prompts
Corrective prompt generation: future

From deviating from the goal (explicit):
Did you mean: I want to go to the airport

To continuing the dialogue (implicit):
You want to go to the airport, and when would you like to leave?
A study of lexical entrainment

- Can non-native speakers learn to use correct patterns in real situations from lexical entrainment?

- Subjects:
  - 2 groups: test (13) and control (12)
  - Equal M&F; about 2 yrs in US; avg TOEFL 620
  - Native speakers of: Mandarin (15), Korean (5), Cantonese (5)
A study of lexical entrainment

- Room reservations at Carnegie Mellon
- Wizard of Oz
  - Based on a study of calls to room reservation
  - Scenario to carry out ("get a room for 150 people")
- Explicit correction
  - "Sorry did you mean to say..."
- 6 dialogues per caller (150 total)
  - #1 - 3 on Day1; # 4 - 6 on Day2
A study of lexical entrainment

○ Vocabulary:
  ● Terms: “a machine that shows pictures on the screen”
  ● Numbers: “Wean Hall two thousand forty hundred, please”

○ Grammar:
  ● Verb usage: “the room that hold 134 people”
  ● Plurals: “a room for 50 person”
  ● Date/time: “from 4 to 6 o’clock PM”
  ● Time span: “for Wednesday between 10 to 12”
  ● Prepositions: “Confirm me the reservation”
  ● Article use: “a room with projector and a windows”

Background Description Study
Lexical Entrainment vs Control

% lexical errors per dialogue (Error = per turn)

dialogues: (1-3= 1st day, 4-6= 2nd day)

Group with entrainment
Control

Background
Description
Study
Discussion

- The relative error rate decline for the Test group was 22%; it was 18% for the control
  - Not significant between the 2 groups
- The decline from Dialogue 1 to 6 is significant for the Test Group
- Future, to confirm findings:
  - A tighter control (homogeneity) of the content of each dialogue
  - Random presentation of the dialogues would confirm these results
Conclusions

- Spoken dialogue systems can be used as a medium for informal language learning.
- Lexical entrainment may lead to correction of grammar errors in fluent speech.
- We need more data to be able to look at:
  - Grammar vs vocabulary
  - Groups of speakers
- Elicitation at all levels
  - Hirschberg – Columbia games corpus
  - For native speakers
- From WOZ to studies using the real Let’s Go entrainment system

That’s all, folks!
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