AutoLearn’s authoring tool
A piece of cake for teachers

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Outline

• Motivation and goal
• A tool for authoring ICALL materials
• Using and evaluating of AutoTutor
• Concluding remarks
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Motivation: ICALL’s *irony*

**ICALL FIGURES**

- 119 projects from 1982 to 2004 (Heift & Schulze, 2007)
- Half a dozen ICALL systems are continuously used in real-life instruction settings (Amaral & Meurers, submitted; Heift & Schulze 2007)

**CRUCIAL ASPECTS**

- Appropriate integration in the learning context (Levy 1997, 200-203)
- Successfully restrict learner production in terms of NLP complexity (Amaral and Meurers, submitted)
Motivation: FLTL requirements

ICAL meeting FLTL

- Feedback has to be coherent with
  - syllabus,
  - teaching approach, and
  - activity goals (focus on form/content)

- Ideally has to respond to real-life needs
  (Amaral 2007)
Motivation: involve FLTL practitioners

**FLTL experience**

• Integration of out-of-class work thoughtfully and coherently designed – with the needs of the learner in mind (Levy and Stockwell, 2006: p. 11 – 12)

**CALL tradition**

• Authoring tools have a long tradition in CALL, but practically inexistent for ICALL (Levy 1997, chap. 2, Toole and Heift 2002)
Goal: one NLP response

• to shape language technology to the needs of the teachers (and learners) by

  – allowing for feedback generation focusing both on form and on meaning

  – providing a tool and a methodology for teachers to author/adapt ICALL materials autonomously
Outline

• Motivation and goal
• A tool for authoring ICALL materials
  • General functionalities (and GUI)
  • Answer specifications
  • NLP-resource generation
• Using and evaluating of AutoTutor
• Concluding remarks
Context: AutoLearn project

**Goals**

- Integrate existing ICALL technology in Moodle  
  (ALLES project, Schmidt et al. 2004, Quixal et al. 2006)
- Evaluate such an FLTL paradigm for different learning scenarios

**Participants**

- Fundació Barcelona Media Universitat Pompeu Fabra, Barcelona  
  (coord., NLP-based applications, HCI)
- Institut für Angewandte Informationsforschung, Saarbrücken (NLP)
- Heriot-Watt University, Edinburgh (FLTL, SLA)
- Bogazici University, Istanbul (FLTL practice)
AutoTutor: ICALL for Moodle

**Definition**

- A web-based software solution to assist non-NLP experts in the creation of language learning materials using NLP-intensive processing techniques

**Teacher perspective**

- A tool to create, manage, and track ICALL activities including (NLP-based) feedback on form/content

**Learner perspective**

- To do the exercises and get feedback
- To track own activity
AutoTutor: architecture and process
AutoTutor: functionalities (I)
AutoTutor: functionalities (II)

Updating AutoTutor in topic 1

General

Name* Watch - Managing our waste
Summary

Link to a file

Location Unit2/TurnWaste_exercise.html
Choose or upload a file ...

AutoTutor configuration

Choose a feedback name* TurnWaste
AutoTutor: functionalities (III)

<table>
<thead>
<tr>
<th>Feedback to spelling and grammar</th>
<th>Feedback to content</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The ecologic <strong>footprint</strong> is a measure of human demand on the Earth's ecosystems. This word should start with a capital letter. Use instead: Footprint</td>
<td>1. The ecologic <strong>footprint</strong> is a measure of human demand on the Earth's ecosystems. This part of the answer contains relevant keywords but something is wrong. Please check!</td>
<td>Click to insert a comment...</td>
</tr>
<tr>
<td>2. The <strong>ecologic</strong> footprint is a measure of human demand on the Earth's ecosystems. This word is unknown. Does it contain a spelling error? ecological</td>
<td></td>
<td></td>
</tr>
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</table>
AutoTutor: doing activities

Managing our waste

Watch and listen to the video below. Then answer the questions on the right hand side of the screen.

Turning waste into resources

Questions

1) Which is both the challenge and the opportunity of managing our waste?

2) If we do not recycle the stock of aluminium and steel in our society, where would they come from?
AutoTutor: immediate feedback

1. The old mosque is famous **for his dome**.

Please check the appropriate form of the possessive pronoun for objects in English.
Short () on the NLP side

Step One: General Language Checking

- **Tokenizer**
- **Morph. Analysis**
- **Spell Checking**
- **Grammar Checking**

Step Two: Specific Language Checking

- **General Content Evaluation**
- **Specific Form Checking**
- **Customized Specific Checking**
- **Content Matching**

Additional elements:

- **Lexicon**
- **Exercise-Specific Lexicon**
ATACK: answer specification (I)

A QUESTION

Define the ecological footprint in your own words.

POSSIBLE ANSWERS

1. The ecological footprint relates to the impact of human activities on our environment.
2. It is an indicator that measures the surface needed to produce our resources and absorb the waste we generate.
1. The ecological footprint relates to the impact of human activities on our environment.
2. It refers to an indicator that estimates the surface needed to produce our resources and absorb the waste we generate.
ATTACK: answer specification (III)
ATTACK: answer specification (IV)
ATTACK: NLP resource generation

**ANSWER MODEL**
- **Blocks (Chunks)**
- **Block Order**

**ERROR MODEL**
- **Error Patterns**

**MORPHOLOGICAL ANALYSIS**

**MATCH SETTINGS**

**EXERCISE-SPECIFIC LEXICON**

**CONTENT MATCHING**

**EXERCISE-SPECIFIC ERROR CHECKING**

**GLOBAL ANSWER WELL-FORMEDNESS**

**CUSTOMIZED FEEDBACK**

**DESAMBIGUATION OF LEMMA**
ATACK’s underlying NLP strategy

**Technical Aspects**

- Processing is a pipeline (no stand-off annotation)
- Shallow template-based (info) chunking using both relaxation techniques and buggy rules
- KURD: constraint-based formalism – Finite State Automaton enhanced with unification

(Carl and Schmidt-Wigger 1998)
ATACK: underlying NLP formalism (I)

Disambiguate_Noun_Phrase =
\[\forall e \{ c=w, sc=art, agr=\_AGR \},\]
\[\forall a \{ c=adj, agr=\_AGR \},\]
\[\forall c \{ c=noun, agr=\_AGR \},\]
\[\forall u \{ agr=\_AGR \}\]
ATTACK: underlying NLP formalism (II)
ATTACK: “info” chunker

FOR EACH “INFO”-CHUNK A CORRESPONDING ANALYSIS RULE IS CREATED

“an indicator”

LemmaStuffMissing =

?$$-la\{tag~:c1\},$

^Aa\{lu=a;the,disc=_\},

Ba\{lu=indicator,disc=_\} :::

Ar\{disc=C,tag=b10\}g\{flaga=small,flage=an\},

Br\{disc=C,tag=b10\}g\{flaga=small;det_a,

flagb=noun_sg,flage=indicator\},

j(rule=@end10).

• Word-level
• Word level with extra-stuff
• Lemma-level
• Lemma-level with extra stuff
• Lemma-level with stuff missing
• Some “key” words (concept words)
ATACK: “global” well-formedness

Block order combinations are checked for (deviant structures inc.)

ori_chunked_gap_no_need=
?-1a{chunked=a_G_A_C2_D2_F_E, a_G_A_H_B1_C2_D2_F_E_;a_G_A_H_B1_C1_D1_D1_E_; a_C2_D2_F_E_;a_C1_D1_D1_E_},
+Aa{flagc~=_;lu~=@;&at,snr~=1000}e{flagc=g;style=no_need} :::
Ar{style=no_need,bstyle=no_need,estyle=no_need},
?-1g{style=no_need}.
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AutoLearn: testing in real-life (I)

Preparation of testing:
- Recruiting: two workshops with over 60 participants

System usage:
- Material development (training plus development)
- Material selection
- Testing action preparation (book PC-labs, etc.)

Analysis of testing action:
- Questionnaires for learners
- Questionnaires and interviews with teachers

78% would only use ICALL materials if ready-made.
AutoLearn: testing in real-life (II)

Participants in testing

• 3 universities: 5 different classes (EN, DE)

• 7 secondary school teachers: 10 classes (EN)

• 5 language school teachers: 5 classes (EN)
AutoLearn: training ICALL developers

• 4-hour course (2 sessions), plus 4 control meetings (and individual work)
  • How to plan, pedagogically speaking, a learning sequence including ICALL materials?
  • What can NLP do for you?
  • How do you use ATACK’s GUI?
Learnt from cooperation with teachers

• Designing FLT materials knowing in advance that they will be part of an ICALL system is more difficult than selecting activities from books
  • The notion of time
  • The notion of space

• The lack of expertise in using ICALL/NLP results into overdemanding or not challenging NLP tasks
Learning to restrict NLP complexity (I)

Questions

Think about your consumption.

Which is your attitude concerning responsible consumption? How do you deal with recycling? Do you think yours is an ecological home? Are you doing your best to reduce your ecological footprint? Make a list of 10 things you could do to reduce, reuse or recycle your waste at home.
Learning to restrict NLP complexity (II)

1. Which is both the challenge and the opportunity of managing our waste?
2. If we do not recycle the stock of aluminium and steel in our society, where would they come from?
3. What consequence has the 1994 packaging directive on people’s behaviour?
4. For which two types of products have hazardous substances been prohibited in their production?
5. What should we require from Europe to become a recycling society?
Analysing AutoTutor’s performance

**Activity type: reading comprehension**

Q1: *Explain in your words what the ecological footprint is.*

Q2: *What should be the role of retailers according to Timo Mäkelä?*

<table>
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<tr>
<th>Question</th>
<th>Inv.</th>
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<tr>
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<td>73</td>
</tr>
<tr>
<td>2nd</td>
<td>21</td>
<td>100</td>
</tr>
</tbody>
</table>
Building a “gold standard”

**Out of 173 manually reviewed attempts**

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<td>2nd</td>
<td>14</td>
<td>29</td>
<td>36</td>
<td>21</td>
<td>100</td>
</tr>
</tbody>
</table>
Quantitative analysis (accuracy)

<table>
<thead>
<tr>
<th>MESSAGES</th>
<th>REAL ERRORS</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Form</td>
<td>Cont</td>
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<tr>
<td>CORRECT ANSWERS</td>
<td></td>
<td></td>
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<td></td>
<td>31</td>
<td>139</td>
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<tr>
<td>PARTIALLY CORRECT</td>
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<tr>
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<td>41</td>
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</table>

<table>
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<td>20</td>
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</table>
## Main causes of misbehaviour

<table>
<thead>
<tr>
<th>MISBEHAVIOUR</th>
<th>PHASE 1</th>
<th>PHASE 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connection failed</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Bad use of the system</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>System misleading learner</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>False positive (L1-driven, OOV)</td>
<td>22</td>
<td>33</td>
</tr>
<tr>
<td>Inappropriate focus on form</td>
<td>35</td>
<td>21</td>
</tr>
<tr>
<td>Artificial separation of messages</td>
<td>0</td>
<td>61</td>
</tr>
<tr>
<td>Poor specifications</td>
<td>1</td>
<td>62</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>64</strong></td>
<td><strong>180</strong></td>
</tr>
</tbody>
</table>
Inappropriate focus on form

“Rare” entries

1. the ecological footprint is a measure of the human demand on the Earth ecosystems. Words at the beginning of sentences begin with a capital letter. Use instead: The

2. the ecological footprint is a measure of the human demand on the Earth ecosystems. This word should start with a capital letter. Use instead: Footprint

Spell and grammar checking

Misbehaviour in formal aspects
The ecological Footprint, is measures the surface area needed to produce the resources we consume in daily life, and to absorb the wasted generated by the use of these resources. This part of the answer contains relevant keywords but something is wrong. Please check!

2. The ecological Footprint, is measures the surface area needed to **produce the resources we consume** in daily life, and to absorb the wasted generated by the use of these resources. This part of the answer contains relevant keywords but something is wrong. Please check!

3. The ecological Footprint, is measures the surface area needed to produce the resources we consume in daily **life, and** to absorb the wasted generated by the use of these resources. This part of the answer contains relevant keywords but something is wrong. Please check!

4. The ecological Footprint, is measures the surface area needed to produce the resources we consume in daily life, and to **absorb the** wasted generated by the use of these resources. This part of the answer contains relevant keywords but something is wrong. Please check!

5. The ecological Footprint, is measures the surface area needed to produce the resources we consume in daily life, and to absorb the wasted **generated** by the use of these resources. This part of the answer contains relevant keywords but something is wrong. Please check!

6. The ecological Footprint, is measures the surface area needed to produce the resources we consume in daily life, and to absorb the wasted generated by the **use** of these resources. This part of the answer contains relevant keywords but something is wrong. Please check!

7. The ecological Footprint, is measures the surface area needed to produce the resources we consume in daily life, and to absorb the wasted generated by the use of **these resources**. This part of the answer contains relevant keywords but something is wrong. Please check!

8. The ecological **Footprint**, is measures the surface area needed to produce the resources we consume in daily life, and to absorb the wasted generated by the use of these resources. This part of the answer does not correspond to any part of the answers stored by the system. Please check!

9. The ecological Footprint, is measures the surface area needed to produce the resources we consume in **daily** life, and to absorb the wasted generated by the use of these resources. This part of the answer does not correspond to any part of the answers stored by the system. Please check!

10. The ecological Footprint, is measures the surface area needed to produce the resources we consume in daily life, and to absorb the wasted generated by the use of these resources. This part of the answer does not correspond to any part of the answers stored by the system. Please check!
3. The ecologic footprint is a measure of the human demand on the Earth ecosystems. This part of the answer does not correspond to any part of the answers stored b

4. The ecologic footprint is a measure of the human demand on the Earth ecosystems. This part of the answer does not correspond to any part of the answers stored b
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Conclusions: improve coverage

To reduce the effects of poor specifications

• Support material designers with semantic driven techniques for expansion of their possible answers → RTE-like?

• Add functionalities to teacher interface to easily extend exercise models or specific feedback messages using learner answers inappropriately handled by the system
Conclusions: improve accuracy

To reduce false positives

- Adapt general (non-customizable) NLP resources to better handle L2 learner profiles

To reduce the effects of artificial separation

- Better exploit the information provided by teachers in the block definition process
- Use a parser that allows for the grouping of syntactic or/and informational units
Conclusions: general message

• It was
  • Feasible to overcome ICALL’s irony
  • Possible to meet some FLTL requirements
  • Incredibly useful to involve real-life teachers and learners in testing
• NLP developers need to work closely together with FLTL trainers if we want to promote the use of ICALL
Thanks for your attention!

Questions or remarks?

http://autolearn.barcelonamedia.org/
http://parles.upf.edu/autolearn/
http://parles.upf.edu/autolearnTutorKit

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References


References III
