Intelligent Computer-Assisted Language Learning

Part V: Authentic Text ICALL (ATICALL)
Exercise Generation & Information Retrieval for Language Learning

Detmar Meurers
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based on joint research with
Luiz Amaral, Vanessa Metcalf, Niels Ott

(cf. Amaral, Metcalf, Meurers 2006; Metcalf, Meurers 2006, Ott 2009)

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Introduction

- The use of NLP in ICALL has primarily centered on diagnosing learner errors and, more recently, testing and assessment.
- Idea: Explore how NLP technology can support other aspects of second language learning.
- Our specific focus: What can NLP contribute to awareness of language forms and rules, an important component of adult second language acquisition?
  - WERTi: Automatic generation of language awareness activities based on real-world texts.
  - IR4LL: Retrieval of authentic texts at the appropriate level for language learners

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Pedagogical grounding of our research

Awareness

Awareness (Schmidt 1995):

- Noticing
  - “conscious registration of an event”
  - low level of awareness
  - implicit learning

  E.g.: noticing that sometimes speakers of Spanish omit the subject pronoun
- Understanding
  - “recognition of a general principle, rule or pattern”
  - higher level of awareness
  - explicit learning
  - generalization can be internally generated or externally provided

  E.g. understanding that Spanish is a pro-drop language

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The role of awareness

- Research on awareness shows:
  - There is no learning without noticing.
  - Awareness without input is not sufficient.
  - “Learning takes place within the learner’s mind and cannot be completely engineered by teachers or syllabus designers.”
  - One can only provide opportunities for developing learner awareness.

⇒ Consequences:
  - Learners have to be exposed to linguistic features to acquire them.
  - Learners have to notice those features.
  - Tools presenting such linguistic features in a contextualized way, allowing for student interaction, can be helpful.

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Linguistic information and how it is conveyed

- A wide range of linguistic features can be relevant for awareness, incl. morphological, syntactic, semantic, and pragmatic information (cf. Schmidt 1995, p. 30).
- Linguistic information can be conveyed to the learner
  - using explicit linguistic terminology/representations, e.g.:
    - parts of speech
    - verbal tense, mood and aspect
    - sentence classification
    - syntactic analyses (shown as trees or sentence diagrams)
  - using implicit presentation, e.g.:
    - coloring, underlining, moving, etc
    - pointing to correct or incorrect uses

⇒ Awareness activities can include both implicit and explicit presentation of linguistic features.

Modeling FLT practice

- A common pedagogical practice in FLT moves from target language presentation, to practice, on to production.
- Proposal: Create sequences of linguistic awareness activities following the initial stages of such a progression:
  I. Receptive presentation
  II. Productive presentation
  III. Controlled practice
- What makes this idea interesting?
  - NLP technology can identify certain relevant linguistic categories and forms in real-life texts.
  - The contents of these texts can be selected by the learners based on their interests.
  - The sentences turned into exercises can remain fully contextualized as part of the text selected by learner.
  - Automatic feedback for the activities is feasible since the original text is known.

The activity progression in WERTi

Using real world web-based texts (such as news articles) we provide a progression of activities:

Step 1. Receptive presentation

Ex. The system colors examples of targeted items.

Step 2. Productive presentation

Ex. The learner is asked to find and mouse-click all tokens of the targeted category. The system shows correct picks in green, incorrect ones in red.

Step 3. Controlled practice

Ex. The learner is asked to

- reorder words/phrases given (scrambled) list
- complete fill-in-the-blank (FIB) slots
  - created for tokens of targeted category
  - given some information, where needed (e.g., stems)

Examples for an activity progression

1. Pronouns

Step 1. Receptive presentation

Ex. System colors different pronoun types.

(1) *Someone told me that he accidentally hit himself in the face with his car keys.*

Step 2. Productive presentation

Ex. Click on examples of a particular type of pronoun.

Step 3. Controlled practice

Ex. Fill in all pronouns in a text.

Ex. Find and correct incorrect pronoun choices in text. E.g.: *That's him car.* → *That's his car.*

Examples for an activity progression

2. Passive

Step 1. Receptive presentation

Ex. System colors passive verb forms.

(2) *Her purse was taken while she wasn't looking.*

Step 2. Productive presentation

Ex. Click on passive sentences

Step 3. Controlled practice

Ex. Given the main verb stem, fill in the passive verb string (i.e., the correct form of *be* and the past participle form of the main verb).

Ex. Given an active sentence, transform the sentence to a passive using a combination of click and drag, and FIB.

Examples for an activity progression

3. Adverb placement

Step 1. Receptive presentation

Ex. System colors verbs and verb-modifying adverbs.

(3) *The house had already been damaged.*

Step 2. Productive presentation

Ex. Click on adverbs in a particular position:

- at the beginning of a sentence
- between a main verb and a prepositional phrase
- before an auxiliary verb

Step 3. Controlled practice

Ex. Given constituent chunks and an adverb, with instructions on where this adverb should go, put the sentence together.

Examples for an activity progression

4. Tense and Aspect

Step 1. Receptive presentation

Ex. System colors examples of different aspectual meanings together with relevant contextual cues.

(4) a. *We are going to New York tomorrow.*

b. *We usually go to the grocery store on Fridays.*

Note: While the effect is semantic, the cues are lexical.

Step 2. Productive presentation

Ex. Click on sentences expressing a particular kind of meaning with the targeted verb forms, e.g., expressing future plans using present tense.

Step 3. Controlled practice

Ex. Given a main verb stem, provide the appropriate verb string using cues from context.

What is involved in realizing such an approach?

- Two components can be distinguished:
  1. Obtaining and selecting appropriate texts:
     - Texts obtained through web search using terms provided by the language learner
       – restrict web to news sites (e.g., Reuters)
       – alternative: specific corpora
     - Texts could be filtered according to aspects relevant to lanuage learning (text readability, frequency of relevant constructions, etc. → IR4LL discussion below)
  2. Identifying the targets in the selected texts and creating
     - receptive and productive presentations, and
     - controlled practice exercises using the texts.
- We illustrate the approach, focusing on the second component, by showcasing an activity progression targeting prepositions.

Realizing the proposal
Creating an activity sequence

- The system first annotates the web page text using efficient and robust NLP tools performing
  - tokenization → tokens
  - lemmatization → word roots
  - part-of-speech tagging → lexical categories
  - morphological analysis → morphological properties
  - shallow parsing → phrasal categories
- The language items targeted by the activity are identified using regular expression matching of target and contextual items in the annotated text.
- The nature of the activity determines the complexity of the annotation and the regular expressions required:
  - Preposition activity: single instances of a lexical category
  - Tense and aspect: sequences of auxiliaries, inflected forms, and specific lexical items (contextual cues)

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Prototype realization

- Original prototype in Python, integrated into the Apache2 webserver using mod_python, including:
  - searching in the Reuters site providing news webpages
  - linguistic annotation using NLTK (Bird & Loper 2004), TreeTagger (Schmid 1994)
- Recently reimplemented as UIMA-based Java servlet on Tomcat server (Aleks Dimitrov, Ramon Ziai, Niels Ott).
- The annotated text is mapped into Color, Click, and FIB presentation code (HTML and JavaScript), and fully integrated in the original web page.
- Only a standard web browser is needed to use the system.
- We are working on integrating further target patterns and activities. Prototypes available at:
  - original prototype: `http://purl.org/net/WERTi`
  - current prototype: `http://delos.sfs.uni-tuebingen.de:8080/WERTi`

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WERTi

Working With English Real Texts:
An Intelligent Workbook for English

Search Home Logout Help

Prepositions

Search in Reuters news to obtain a text you want to work with:

cows

Reuters News Search

Preposition Activities

- **Color**
  WERTi shows you all the prepositions in the text in blue.
- **Click**
  Find the prepositions and click on them.
- **Fill-in-the-blanks**
  Fill in all the prepositions in the article.

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Prepositions

Select an activity based on the results of your search:

Mooove slowly and don ' t hug cows , hikers told (Wednesday, August 30, 2006 1:01 AM ET)
Evelyne Zaugg of the Swiss Hiking Federation said that while there were no precise statistics on incidents involving **cows** , walkers are reporting more run-ins...
Color Click Fill-in-the-Blanks

Cows ' moo ' with an accent, farmers believe (Thursday, August 24, 2006 2:04 AM ET)
LONDON (Reuters) - **Cows** have regional accents, a group of British farmers claims, and phonetics experts say the idea is not as far-fetched as it sounds....
Color Click Fill-in-the-Blanks

US drivers subsidize European pump prices -report (Thursday, August 31, 2006 9:13 AM ET)
average 334 percent. American consumers have become the " cash **cows** " for the international oil industry, the study said. Unlike US...
Color Click Fill-in-the-Blanks

Accidental death of bear fuels passions in France (Wednesday, August 30, 2006 5:53 AM ET)
spokesman for ASPAP, a group that represents farmers who have protested against the reintroduction program which they say threatens sheep and cows that graze...
Color Click Fill-in-the-Blanks

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Cows 'moo' with an accent, farmers believe

Thu Aug 24, 2006 8:58am ET

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LONDON (Reuters) - Cows have regional accents , a group of British farmers claims , and phonetics experts say the idea is not as far-fetched as it sounds .

Lloyd Green , from southwest England , was one of a group of farmers who first noticed the phenomenon .

" I spend a lot of time with my Friesians and they definitely ' moo ' with a Somerset drawl , " he said , referring to the breed of dairy cow he owns .

" I 've spoken to the other farmers in the West Country group and they have noticed a similar development in their own herds .

" I think it works the same as with dogs - the closer a farmer 's bond is with his animals , the easier it is for them to pick up his accent . "

Dom Lane , spokesman for a group called the West Country Farmhouse Cheesemakers to which Green belongs , said it contacted John Wells , Professor of Phonetics at University College London , who said that a similar phenomenon had been found in birds .

" You find distinct chirping accents in the same species around the country . This could also be true of cows , " Wells said on the group 's Web site (replaced-dns)

According to Lane , accents among cows probably develop in a similar way as among humans , and resulted from spending time with farmers with differing accents .

" Apparently the biggest influence on accents is peer groups - on children in the playground , for example , " he said . " Herds are quite tight-knit communities and do n't tend to leave the area . "

He added that more scientific research was needed to prove what was just an anecdotal theory at this stage .

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" You find distinct chirping accents ____ ? the same species ____ ? the country . This could also be true ____ ? cows , " Wells said ____ ? the group 's Web site (replaced-dns)

According to Lane , accents ____ ? cows probably develop ____ ? a similar way ____ ? ____ ? humans , and resulted ____ ? spending time ____ ? farmers ____ ? differing accents .

" Apparently the biggest influence ____ ? accents is peer groups - ____ ? children ____ ? the playground , ____ ? example , " he said . " Herds are quite tight-knit communities and do n't tend to leave the area . "

He added ____ ? more scientific research was needed to prove what was just an anecdotal theory ____ ? this stage .

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Realizing the proposal

Some challenges

- Annotation errors:
  - Statistical NLP tools are efficient and robust
  - Such tools make errors, e.g., 3–5% for POS tagging.
  - What impact do such errors have for the envisaged use?
  - It is known where errors are likely to arise (cf., e.g., Dickinson & Meurers 2003; Dickinson 2005), so one can avoid basing activities on likely error locations.
- The complexity of real life:
  - Real-life texts from the web often have
    - complex structure
    - mark-up and integrated multimedia
  - It is nontrivial to preserve that structure and mark-up during linguistic annotation of the text base.
  - Receptive and productive presentation can be added modularly to an existing document (mark-up/javascript); inserting forms for practice more challenging.

Related approaches

The MIRTO project (Antoniadis et al. 2004)

- Similarities
  - Emphasizes pedagogical practice and integration
  - Automatic exercise generation:
    - Plans to support “gap-filling” and “lexical spotting” exercises in combination with a corpus database.
- Differences
  - Aims at creating a general toolbox architecture supporting instructor-determined activity design.
  - General toolbox = no explicit mention of language awareness or specific pedagogical progressions or aims

Related approaches

VISL: Visual Interactive Syntax Learning (Bick 2001, 2005b,a)

- Similarities
  - Emphasis on language awareness:
    - VISL offers games and visual presentations to foster knowledge of syntactic forms and functions.
  - Automatic exercise generation:
    - The “exercise building tool” KillerFiller automatically creates slot-filler exercises from texts.
- Differences
  - KillerFiller intended as evaluative tool, not for teaching.
  - Annotated corpora and databases used as text base.
  - Sentences presented in isolation, not in context.
  - Slots determined by general category (e.g., prepositions, verbs), not more specific or other linguistic features.

Related approaches

Generating cloze tests

Automatic generation of multiple choice “cloze tests” (FIB) for language testing and vocabulary drill

(cf., e.g. Coniam 1997; Irvine & Kyllonen 2002; Deane & Sheehan 2003; Huang et al. 2005; Liu et al. 2005)

- Sumita et al. (2005): automatic generation of FIB questions for testing English proficiency
  - \+ selection of seed sentence mentioned as relevant issue
  - \+ uses web to test whether potential distractor items are indeed incorrect
  - – addresses testing, not pedagogical exercise progression
  - – sentences not selected by learner or contextualized

Related approaches

Cognate exercises, FL reading support, FL text retrieval

- False friend (cognate) exercise creation (Wagner 2004):
  - uses authentic corpus material
  - NLP use very limited: only identifies major part-of-speech tokens (those which potentially have cognates)
- Support tools for reading texts in a foreign language support awareness by highlighting linguistic features:
  - *Glosser-RuG* project (Nerbonne et al. 1998): supports reading of French texts for Dutch learners with on-line, context dependent dictionary, morphological analysis, and examples of word use in corpora.
  - *COMPASS* project (Breidt & Feldweg 1997): similar, but focuses on multi-word lexemes
- *REAP*: Automatic retrieval of FL texts for vocabulary learning which are appropriate to learner level

  (Brown et al. 2005; Brown & Eskenazi 2004, 2005)

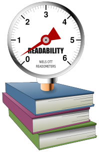
Finding texts appropriate for language learners

- How can one find authentic texts as reading material or for activity generation (e.g., WERTi)?
- Such texts should
  - be in the language of interest
  - have the appropriate level of complexity for the learner
  - contain enough good instances of the language patterns and rules targeted by the activities.
- How about simply using the web and a standard web search engine (e.g., google)?
  - Pro: The Web is huge, and up-to-date information on virtually any topic is available.
  - Cons: Standard search engines are not aware of reading complexity and language patterns.

⇒ Create a dedicated search engine for language learning: IR4LL (Ott 2009)

IR4LL Proposal

- Create a search engine that is aware of variations in text difficulty.
- Challenges and research questions:
  - How to measure text difficulty?
  - Is there enough variety in text difficulty on the web?
    - Are there enough ‘easy’ web pages?



Readability and how to measure it

- Readability or text difficulty: refers to the understandability or comprehensibility of a text (Klare 1963).
- The more reading proficient the reader, the less readable texts need to be in order to be understood by this reader.
- Traditional readability formulas try to measure the readability on a scale, e.g. the U.S. grade level scale.

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U.S. grade level scale

Scale based on Gunning (1968, p. 40):

Grade Level	Named Grade	
17	College	graduate
16		senior
15		junior
14		sophomore
13		freshman
12	High School	senior
11		junior
10		sophomore
9		freshman
8	Eight grade	
7	Seventh grade	
6	Sixth grade	

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Traditional Readability Formulas

- Over two hundred traditional readability formulas have been developed (cf. Dubey 2004).
- They are generally developed for special purposes, such as determining the complexity of military training manuals (Caylor et al. 1973).
- A frequently used traditional readability measure is the Flesch-Kincaid formula (Kincaid et al. 1975)

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Example: Flesh-Kincaid

- Computes U.S. grade level needed to read a text.
- Derived empirically from set of hand-classified documents.

$$\text{Flesch-Kincaid} = -15.59 + 11.8 \cdot AWL_s + 0.39 \cdot ASL$$

Where

$AWL_s = \frac{\text{Number of Syllables}}{\text{Number of Words}}$ Average word length counted in syllables.

$ASL = \frac{\text{Number of Words}}{\text{Number of Sentences}}$ Average sentence length.

- Idea:
  - The longer the word, the harder it is. (and the less common it is, cf. Zipf 1936)
  - The longer the sentence, the harder it is to understand.

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Another example: Dale & Chall (1948)

$$\text{Dale-Chall} = 0.1579 \cdot DS + 0.0496 \cdot ASL + 3.6365$$

Where

DS = Dale Score		The percentage of words outside the Dale list of 3000 words.
$ASL = \frac{\text{Number of Words}}{\text{Number of Sentences}}$		Average sentence length.

- Adds the idea of a specific list of “easy” words.
- List produced by “testing forth-graders on their knowledge in reading of a list of approximately 10,000 words”.
- The more words are outside the set of “easy” words, the more difficult the text is.

Traditional readability measures: Evaluation

- Pros:
  - Relatively simple to use.
  - ‘Simple’ NLP only: tokenizer, stemming, sentence splitter, sometimes syllable counter
- Cons:
  - Originally developed and validated using very small and often highly specific data sets (e.g., technical manuals).
  - Whether the automated analysis using computers agrees with the original human analysis has generally not been validated.
  - Measures such as sentence length are domain-dependent.
  - Underlying assumptions (e.g., ‘long sentences are difficult’) are rather crude generalizations.

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Lexical Frequency Profiles (LFPs)

- Introduced by Laufer & Nation (1995) for the purpose of measuring the vocabulary used by learners.
- Ott (2009) uses LFPs ‘upside down’: measuring vocabulary in texts for learners, not by learners.
- LFPs work with 3 word lists:
  - First 1000 words of the General Service List (West 1953).
    - General Service List: list of words sorted by frequency
  - Second 1000 words of the General Service List.
  - Academic Word List (Coxhead 2000).
    - Underlying assumption: lists are mutually exclusive.

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Lexical Frequency Profile: Example

Results for a typical Wikipedia article:

Word List	**Tokens**		**Types**		**Families**
GSL 1	2202	75.39%	542	54.25%	384
GSL 2	121	4.14%	94	9.41%	78
AWL	245	8.39%	136	13.61%	109
Others	353	12.08%	227	22.72%	n.a.
Total	2921	100%	999	100%	n.a.

- Families: related by simple morphological processes
  - e.g., *happy*, *happily*, and *happyness* are in same family

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Vocabulary-based measures

- Pros:
  - Vocabulary is an important issue for learners.
  - ‘Simple’ NLP only: tokenizer, lemmatizer, perhaps tagger.
  - Measure can be informed by controlled vocabulary lists of text books.
  - Lists can also be extracted from corpora.
- Cons:
  - Vocabulary changes constantly, e.g., the General Service List was published in 1953 and correspondingly does not contain words such as *Internet* or *e-mail*?
  - Vocabulary is domain-specific:
    Does the Academic Word List contain words of your field of research?

Syntactic Complexity

- Vocabulary useful indicator, but if sentences are complex, learners will still have trouble understanding them.
- Sentence length as used in readability formulas simplistic.
- How can syntactic complexity be measured?
- Two simple units (Hunt 1965):
  - Clause: “a structure with a subject and a finite verb”
  - T-unit: “a main clause plus any subordinate clauses”

Measuring syntactic complexity

Lu (2009) automates 14 measures of syntactic complexity which have been discussed as correlating with L2 proficiency:

Type	**Measure**
Length of production	Mean length of clause Mean length of sentence Mean length of T-unit
Sentence complexity	Mean number of clauses per sentence
Subordination	Mean number of clauses per T-unit Mean number of complex T-units per T-unit Mean number of dependent clauses per clause Mean number of dependent clauses per T-unit
Coordination	Mean number of coordinate phrases per clause Mean number of coordinate phrases per T-unit Mean number of T-units per sentence
Particular structures	Mean number of complex nominals per clause Mean number of complex nominals per T-unit Mean number of verb phrases per T-unit

Textbook structures

- Textbooks introduce linguistic categories and forms in order of perceived complexity.
- For the purpose of teaching grammar, particular structures are especially relevant, e.g. ‘give me a text with a lot of gerunds’.
  - Ott & Ziai (2008) developed a constraint grammar-based approach for classifying *-ing* forms into gerunds, participles, and the progressive forms.

Textbook structures: Example

Linguistic structures taught in a textbook for English (Klett: Green Line 4 Weisshaar 2008):

Unit	Structures taught
1	Present perfect progressive with *since* and *for* Past perfect progressive Attributive use of adjectives after nouns Adverbs of degree
2	Perfect infinitive with modal verbs Passive infinitive with full verbs and modals
3	Gerund as subject, object, and after verbs and adjectives with prepositions Object plus *-ing* form Present and past progressive passive Passive with verbs with prepositions
4	Verb plus object plus infinitive Infinitive after question words and after superlatives Infinitives vs. Gerund
5	Non-defining relative clauses Participles as adjectives

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Information Retrieval

Manning et al. (2008, ch. 1):

> *"Information Retrieval is finding material (usually documents) of an unstructured nature (usually text) that satisfies an information need from within large collections (usually stored on computers)."*

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Indexing does the trick in IR!

Simply put:

- Usually one has documents that contain words ("terms").
- Re-sort everything so that one has terms that are associated with documents → indexing.
- Result: the terms from the query can be mapped to terms in the index at low cost, giving you the corresponding documents quickly.

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Example: Boolean index

Doc1:
`Jon loves Vickie.`

Doc2:
`Vickie likes Jackie.`

Doc3:
`Jackie loves Ian.`
`Ian loves Jackie.`

	Doc1	**Doc2**	**Doc3**
`Ian`	0	0	1
`Jackie`	0	1	1
`Jon`	1	0	0
`likes`	0	1	0
`loves`	1	0	1
`Vickie`	1	1	0

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Index with weights: Example

- TF·IDF (Term Frequency · Inverse Document Frequency): Weigh terms which occur in fewer documents more highly.

Doc1:
`Jon loves Vickie.`
Doc2:
`Vickie likes Jackie.`
Doc3:
`Jackie loves Ian.`
`Ian loves Jackie.`

	Doc1	Doc2	Doc3
Ian	0	0	0.95
Jackie	0	0.48	0.35
Jon	0.48	0	0
likes	0	0.48	0
loves	0.18	0	0.35
Vickie	0.18	0.18	0

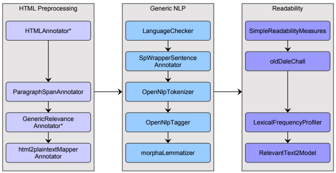
Text models

- All measures are stored in a table for each text.
- The table contains a key (name) for each measure and a value.
- This is flexible since this text model can be extended easily in future versions.
- For IR, an index is generated which contains the terms as well as the information encoded in the text model.

Example of a text model (extract)

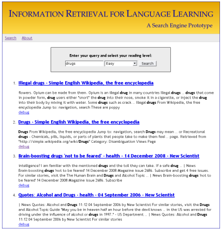
Type	Key	Value
General	Character Count	14249
General	Sentence Count	111
General	Token Count	2542
General	Type-Token Ratio	0.3703
LFP	Academic Word List Token Ratio	0.0816
LFP	Academic Word List Type Ratio	0.1389
LFP	General Service List 1k Token Ratio	0.1389
LFP	General Service List 1k Type Ratio	0.4191
LFP	General Service List 2k Token Ratio	0.0557
LFP	General Service List 2k Type Ratio	0.0841
LFP	Off-List Token Ratio	1.3119
LFP	Off-List Type Ratio	0.1325
Readability	Automatic Readability Index	12.7182
Readability	Flesch Reading Ease	57.6363
Readability	Gunning Fog Index	19.4510
Readability	Original Dale-Chall Score	8.8971

NLP pipelines in the indexer



Demo

http://drni.de/zap/ir4ll



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REAP Search

The REAP system by Heilman et al. (2008) aims at a similar task from a different perspective.

- In their system, a digital library of readings is created by querying AltaVista ('query-based crawling').
- Texts are controlled by a human instructor before they are presented to learners.
- The system aims at reading practice and vocabulary learning. Therefore it uses a special reading interface.
- Instead of text models and query models, the documents are classified using machine learning.
  - This is less flexible because one cannot merge multiple classifications at query time.
- Due to the focus on vocabulary, there is no possibility to query for specific linguistic forms that could be practiced in WERTi.

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Read-X (Miltsakaki & Troutt 2008)

- Similar to REAP, Read-X uses Yahoo!.
- Queries are submitted to Yahoo via its API. Then they are all downloaded and post-filtered for readability.
- Since Read-X is a program running on the learner's PC (not a web application, using IR system or web crawling).
- The system is internally based on the Coleman-Liau index (Coleman & Liau 1975) and the RIX formula (Anderson 1983).
- Read-X also uses text models.
- No classification according to grammatial structures.

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Towards Evaluation

- An experiment with 190.872 unique documents downloaded from 7 online encyclopedias.
- Encyclopedias are likely to contain articles on one topic each, but with different text difficulty.
- Sample of 7.000 text models (1.000 models for each site).

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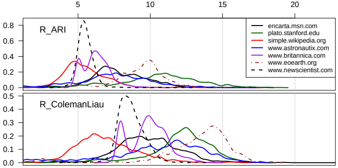
Towards Evaluation: Some results

Distribution of scores from two grade level-based measures:



→ This type of evaluation gives only a first impression. A gold standard (annotated corpus) should be created and used instead.

Summary

- Fostering language awareness is a well-motivated component of FLT.
- We discussed WERTi: web-based activity generator based on real-world texts selected by the learner.
  - a learner-driven approach, in which learners can
    - generate as many activities as they want
    - choose texts that match their interests
  - activities that remain fully contextualized as whole articles with the original web presentation intact
  - learner interaction with simple feedback based on the original text and linguistic analysis
- Develop search for real-world texts supporting a range of reading difficulty measures and specific linguistic categories → IR4LL.

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