Multilingual AceWiki

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AceWiki: a user-friendly expressive semantic wiki system

Semantic Wiki

- problem with traditional wikis
  - content of different pages goes out of sync
  - poor querying possibilities
- semantic wiki = traditional wiki extended with formal semantics
- semantics is usually RDF-like (*subj-pred-obj* triples)
  - e.g. typed wiki links
- two languages: natural + formal
- examples: Semantic Mediawiki, Freebase

AceWiki vs other semantic wikis

Similarities

- collaborative editing (web-based)

Differences

- semantically more expressive reasoning language
  - OWL instead of RDF
- more natural front-end language (ACE)
  - single language, instead of a combination of free-form natural language and formal language
  - scales to handle the increase in expressivity
  - reasoning language hidden from the user

Attempto Controlled English (ACE)

- main product of the Attempto project at Uni Zurich
- goal: highly expressive knowledge representation language with a natural syntax
- both a natural and a formal language
  - natural: syntax and semantics compatible with a subset of English
  - formal: clearly defined translation into first-order logic (FOL)
- multiple reasoners: RACE, OWL/SWRL-based, AceRules, TPTP

Web Ontology Language (OWL)

- decidable fragment of FOL
- reasoning tasks:
  - consistency checking
  - entailment checking
  - sub/super concept hierarchy calculation
  - ...
- multiple reasoners: HermiT, Pellet, Fact++, ...
- W3C Recommendation (2004, 2009)

ACE vs OWL

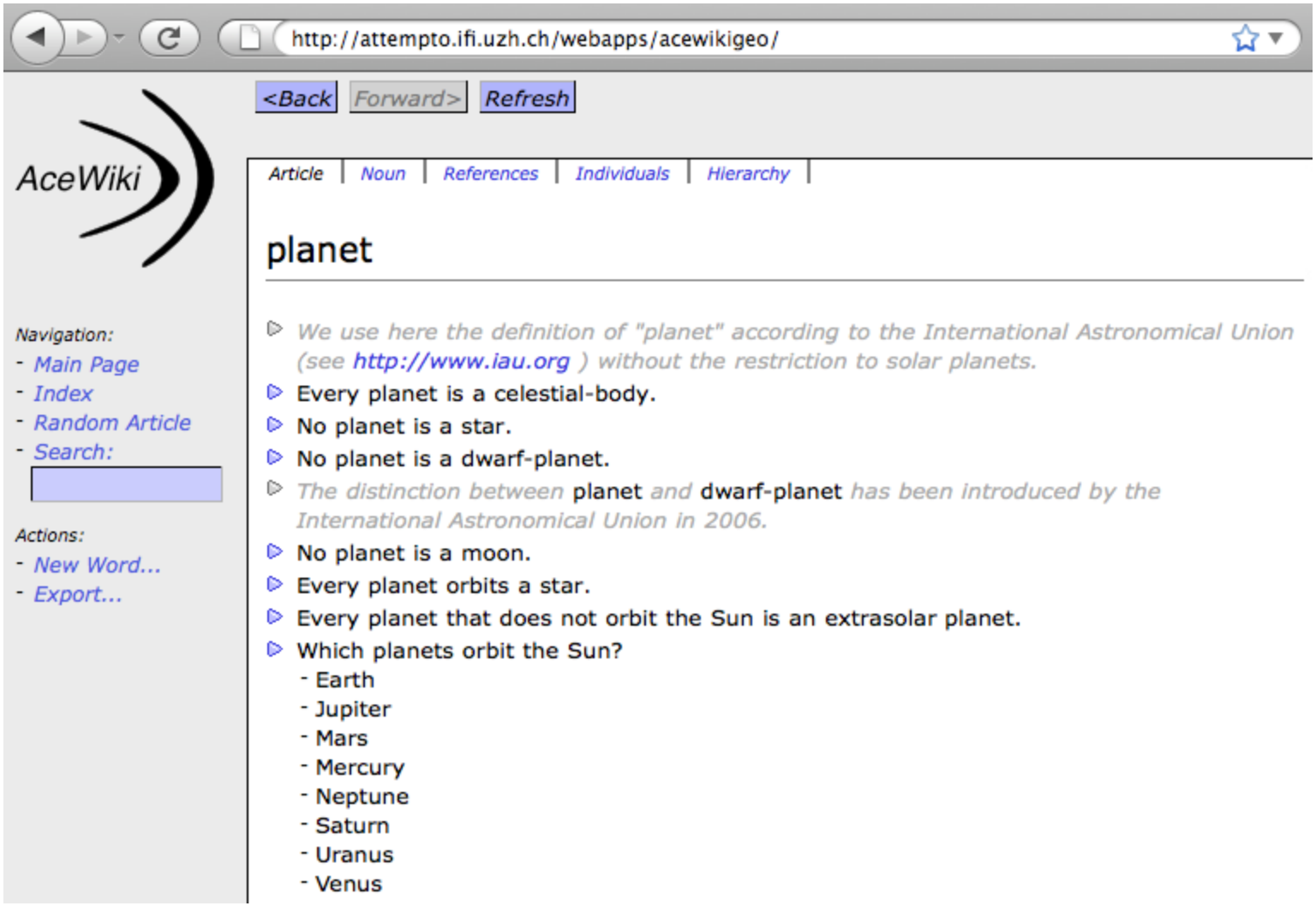
Every country that does not border a sea is a landlocked-country.

```
SubClassOf(
   ObjectIntersectionOf(
      :country
      ObjectComplementOf(
         ObjectSomeValuesFrom(
            :border
            :sea
         )
      )
   )
   :landlocked-country
)
```

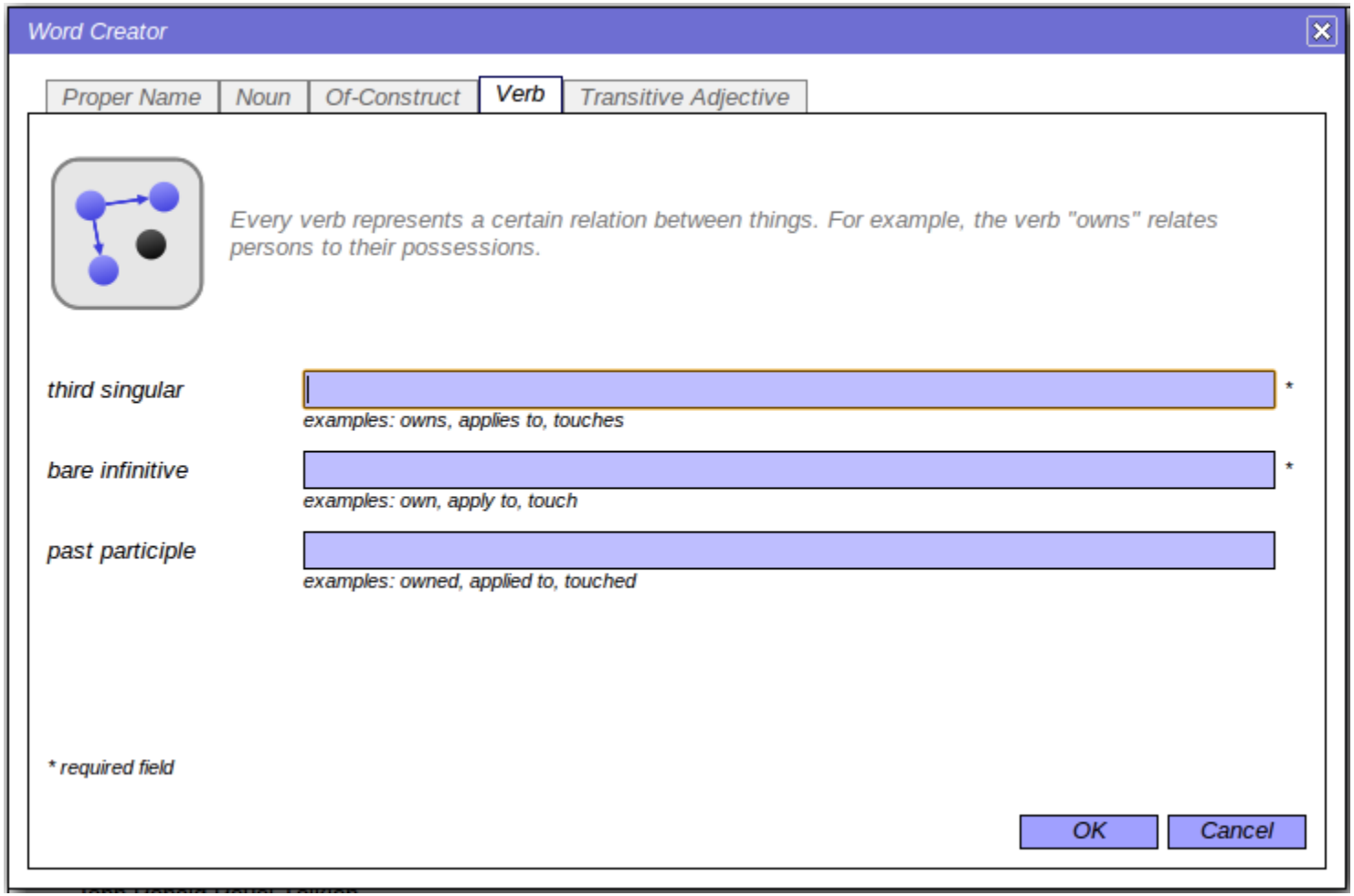
Which country is a landlocked-country?

```
ObjectIntersectionOf(
    :country
    :landlocked-country
)
```

Article (screenshot)


http://attempto.ifi.uzh.ch/webapps/acewikigeo/
<Back
Forward>
Refresh
AceWiki
Article
Noun
References
Individuals
Hierarchy
planet
Navigation:
- Main Page
- Index
- Random Article
- Search:
Actions:
- New Word...
- Export...
We use here the definition of "planet" according to the International Astronomical Union (see http://www.iau.org) without the restriction to solar planets.
Every planet is a celestial-body.
No planet is a star.
No planet is a dwarf-planet.
The distinction between planet and dwarf-planet has been introduced by the International Astronomical Union in 2006.
No planet is a moon.
Every planet orbits a star.
Every planet that does not orbit the Sun is an extrasolar planet.
Which planets orbit the Sun?
- Earth
- Jupiter
- Mars
- Mercury
- Neptune
- Saturn
- Uranus
- Venus

Word creator (screenshot)



Articles and words

Every wiki article has a 1-1 correspondence to a content word

Word

- word classes correspond to logical entities
  - proper name: *individual*
  - noun: *concept*
  - transitive verb, *of*-noun, transitive adjective: *(binary) relation*
- morphological forms: singular, plural, past participle

Article

- sequence of sentences, questions and informal comments
- has corresponding views (automatically generated and uneditable), e.g. *references*, *hierarchy*

Sentences, questions, comments

Declarative sentence

- look-ahead editing
- checked by the reasoner when added/edited, to exclude sentences that
  - would introduce inconsistency, or
  - express something that cannot be expressed in OWL

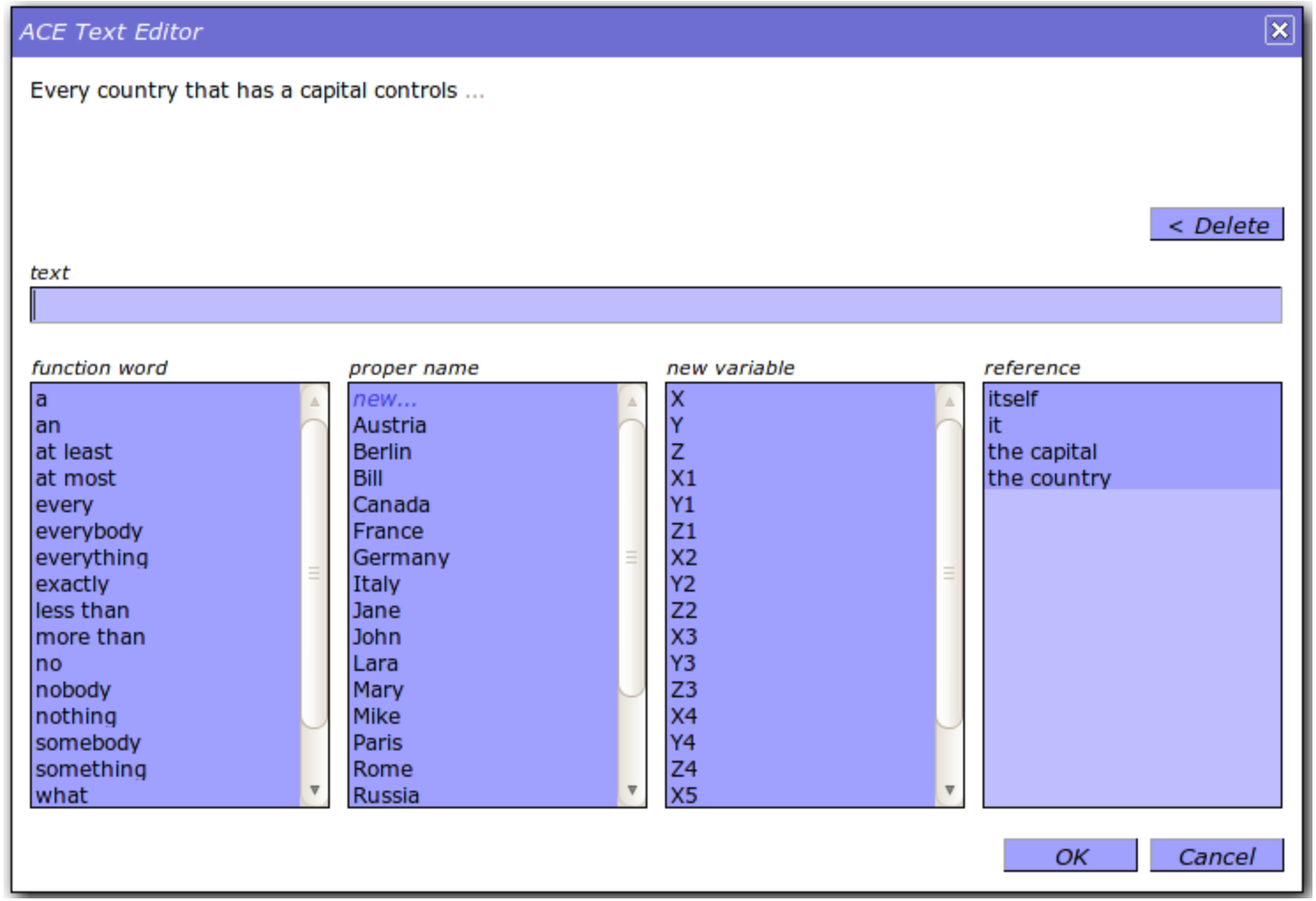
Question

- look-ahead editing
- reasoner supplies the answer and updates it if declarative sentences are changed
  - answer = set of words

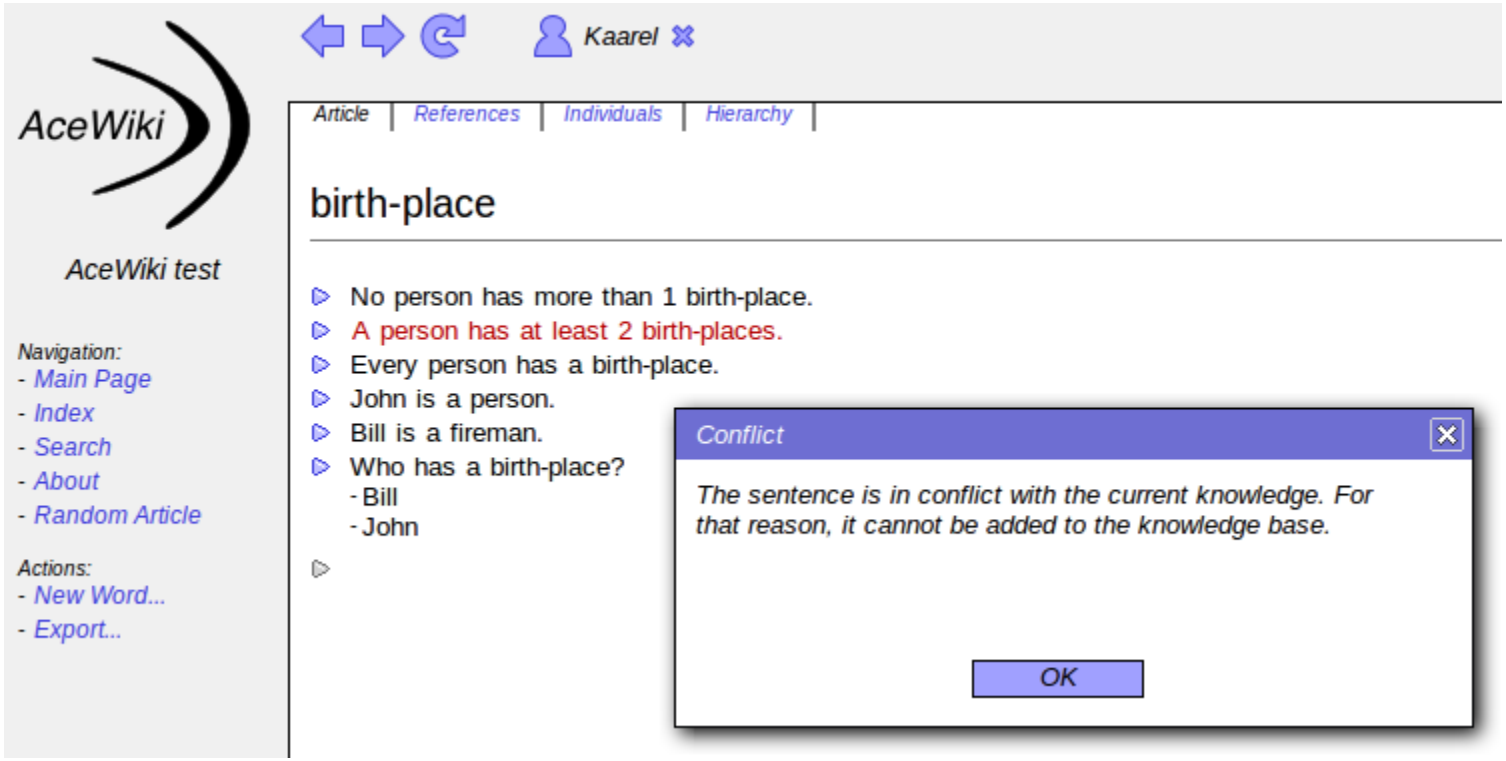
Comment

- plain wiki text (with `[[`hyperlinks`]]`)
- ignored by the reasoner

Look-ahead editor (screenshot)


ACE Text Editor
Every country that has a capital controls ...
< Delete
text
function word
a
an
at least
at most
every
everybody
everything
exactly
less than
more than
no
nobody
nothing
somebody
something
what
proper name
new...
Austria
Berlin
Bill
Canada
France
Germany
Italy
Jane
John
Lara
Mary
Mike
Paris
Rome
Russia
new variable
X
Y
Z
X1
Y1
Z1
X2
Y2
Z2
X3
Y3
Z3
X4
Y4
Z4
X5
reference
itself
it
the capital
the country
OK
Cancel

Reasoning (screenshot)



Multilingual AceWiki

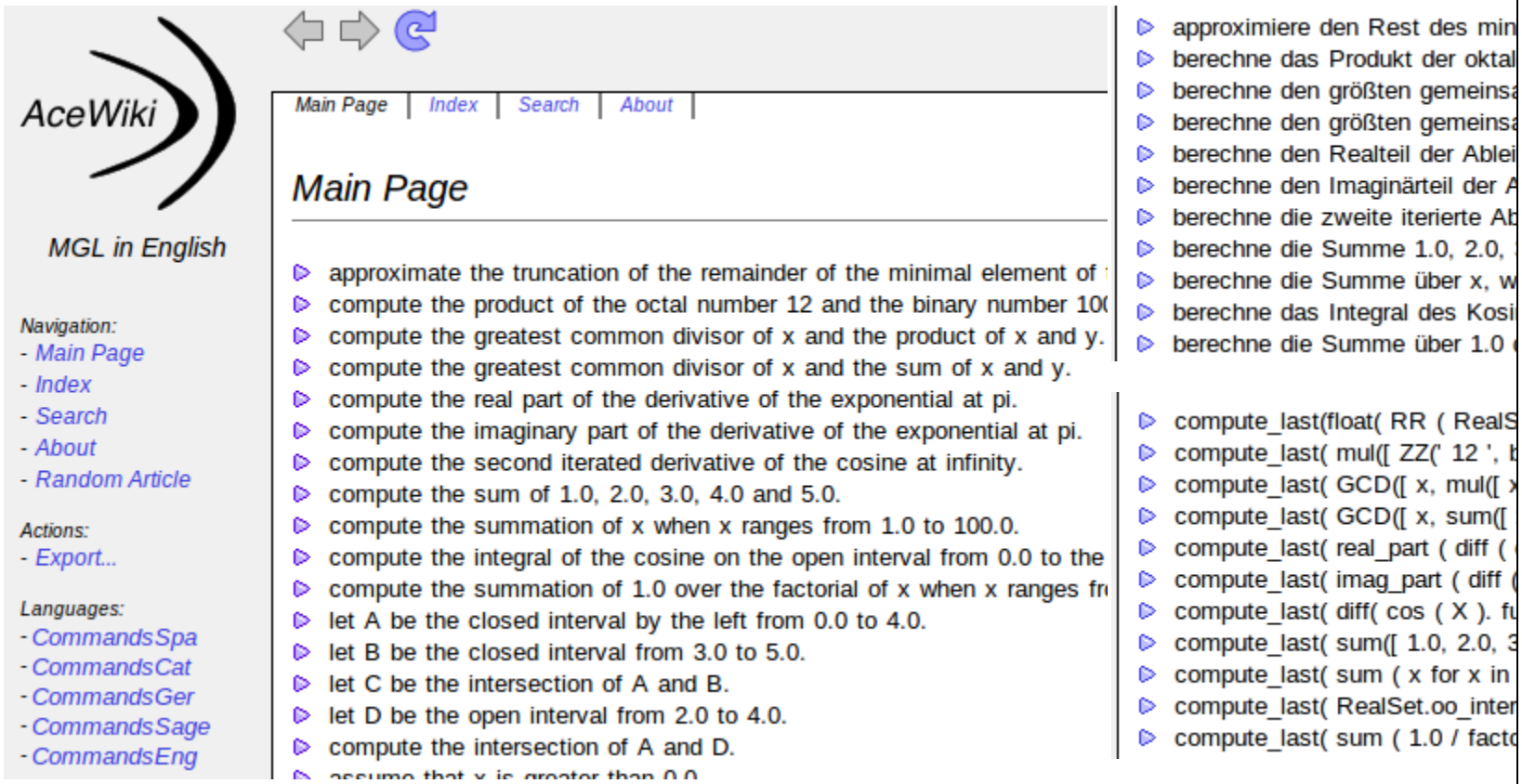
Generalization of AceWiki

- multiple languages
  - natural: English, German, ACE, ...
  - formal: ACE, Sage, ...
  - languages for content, UI, meta information
- multiple grammars
  - ACE (or its subsets)
  - Math Grammar Library
  - Phrasebook
  - ...
- multiple reasoners
  - ACE-based (RACE, OWL-based, ...)
  - Math reasoners, e.g. Sage, WolframAlpha
  - ...

Multiple languages

- multiple languages for
  - content
  - UI (labels etc.)
  - meta queries (authors, edits)
- the content
  - viewable/editable/queryable in every language
  - automatically kept in sync
- some languages are formal, i.e. they are (mainly) meant for the reasoners
- implemented using Grammatical Framework (GF)
  - **single** abstract syntax corresponds to **multiple** concrete syntaxes
  - Resource Grammar Library

Multiple languages (screenshots)



Multiple grammars

- different grammars in different sections of the wiki
- interaction between grammars
  - e.g. detecting sentences that can be parsed by multiple grammars
- integrated grammar editor
  - full GF editor
  - UI for adding/editing words and their forms
- implemented by having multiple GF grammars

Multiple reasoners

- API for calling an external reasoner which provides services of
  - consistency checking
  - Q&A
  - ...
  - explanation of reasoning results
- called over the whole content of the wiki or its fragment

Links

AceWiki

- source: https://github.com/AceWiki/AceWiki
- demos and publications: http://attempto.ifi.uzh.ch/acewiki/
    - *Tobias Kuhn. Controlled English for Knowledge Representation. Doctoral thesis, Faculty of Economics, Business Administration and Information Technology of the University of Zurich, 2010*

Attempto Controlled English

- http://attempto.ifi.uzh.ch

Links (AceWiki in MOLTO)

AceWiki

- source: https://github.com/AceWiki/AceWiki/tree/gfservice

ACE in GF

- https://github.com/Attempto/ACE-in-GF

Multi-lingual demo (JPGF-powered Foods-grammar)

- *English*: http://attempto.ifi.uzh.ch/webapps/gfeng/
- *German*: http://attempto.ifi.uzh.ch/webapps/gfger/
- *Italian*: http://attempto.ifi.uzh.ch/webapps/gfita/

Thank You!