**ARCHITECTURE**

**Pythia** is an ontology-based question answering system that translates natural language questions into formal queries, relying on:

- a compositional construction of general meaning representations
  - captures the semantic structure of the input question
  - covers also complex constructions, such as quantification, comparatives and superlatives, negation, etc.
- a domain-specific grammar generated from an ontology lexicon
  - resulting semantic representations are aligned to a specific ontology, thereby ensuring a precise and correct mapping of natural language terms to corresponding ontology concepts.

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**ONLINE PROCESSING STEPS**

**Parsing and interpretation**

**Pythia** incorporates an Early-style parser for LTAG and a parallel meaning construction that returns underspecified DRSs.

**Example**

Which states border Hawaii?

```
DP
DET which NP
states

V
border

DP
Hawaii
```

**Disambiguation**

The mapping between natural language expressions and ontology concepts need not be one-to-one.

Examples:

- biggest $\sim$ max geo:area, max geo:population
- to have $\sim$ geo:inState, geo:flows_through

**Pythia** resolves ambiguities by means of ontological reasoning, exploiting sortal restrictions in meaning representations.

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**OFFLINE GRAMMAR CREATION**

**Ontology lexicon**

A lemon lexicon specifies linguistic realisations of ontology concepts, in particular word forms, morphological properties, subcategorization frames and how syntactic and semantic arguments correspond to each other.

**Example entry for to border:**

```
: Form
writtenRep = borders@en
tense = present
person = thirdPerson
number = singular
```

**Grammar generation**

Grammar entries consist of a syntactic representation (LTAG tree) and a semantic representation (extended UDRT).

**Example:**

```
S
DP
subj
V
DP
obj
```

Grammar consist of a domain-independent part (wh-words, determiners, auxiliary verbs, etc.) and a domain-specific part, which is automatically generated from an ontology lexicon.

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Demo and more information: [http://www.sc.cit-ec.uni-bielefeld.de/pythia](http://www.sc.cit-ec.uni-bielefeld.de/pythia)