VerbOwl

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Proof of Concept Verbalisation of Afrikaans OWL ontology, comparing grammar engine and template based approaches

Background

- An ontology contains meta-level information about different entities and relations between the entities
- Knowledge representation
- Semantic wiki

What is Ontology Verbalisation

- Ontologies written in formal language
  - Descriptive Logics, OWL
- Domain experts vs. Ontology Engineers
- Natural Language Generation
- Controlled Natural Language

```
<owl:Class rdf:about="&AfricanWildlifeOntology1;lion">
    <rdfs:subClassOf rdf:resource="&AfricanWildlifeOntology1;animal"/>
    <rdfs:subClassOf>
        <owl:Restriction>
            <owl:onProperty rdf:resource="&AfricanWildlifeOntology1;eats"/>
            <owl:someValuesFrom rdf:resource="#Impala"/>
        </owl:Restriction>
    </rdfs:subClassOf>
    <rdfs:subClassOf>
        <owl:Restriction>
            <owl:onProperty rdf:resource="&AfricanWildlifeOntology1;eats"/>
            <owl:allValuesFrom rdf:resource="&AfricanWildlifeOntology1;herbivore"/>
        </owl:Restriction>
    </rdfs:subClassOf>
    <rdfs:comment>Lions are animals that eat only herbivores.</rdfs:comment>
</owl:Class>
```

A lion is an animal.

A lion eats Impala. A lion only eats herbivores.

Aims of this work

- ***Investigate*** and ***compare*** two different approaches to verbalisation.
- One-way verbalisation of an Afrikaans ontology to a controlled language.
- Come up with the templates and grammar frameworks in order to build systems in parallel

Template Based Approach - Lauren

A basic template based approach involves creating a template of sentence structures based on the possible relations between objects and then populating the sentences with axioms from the ontology based on rules relating to which relation is being mapped [Wilcock, 2001].

Templates

```
<Constraint xsi:type="Subtype">
 <Text> -[Subtype]  Each instance</Text>
 <Object index="child"/>
 <Text>is also an instance of</Text>
 <Object index="parent"/>
</Constraint>
```

→ Every _____ is a(n) _____

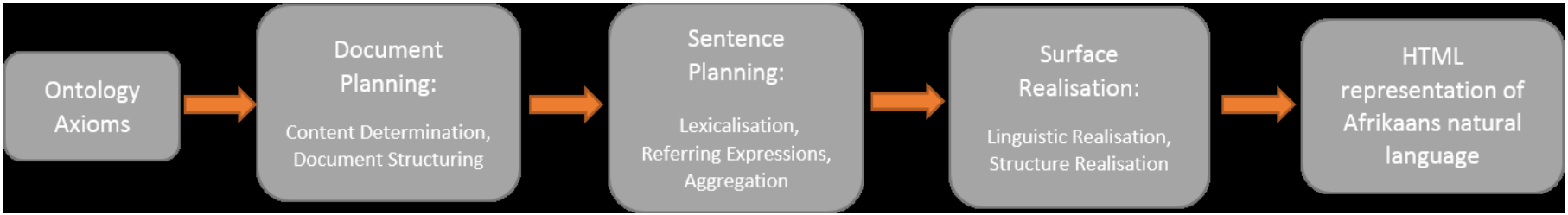
Jarrar, M. and Keet, M. An English Verbalization Template.

Research Questions

- Can ***templates*** be used to ***verbalise Afrikaans ontologies*** into a controlled subset of Afrikaans that is ***relevant*** and ***understandable*** to users who are looking to know the contents of the ontology?

- Can the templates be enriched to provide ***aggregation***, ***referring expressions*** and further lexicalisation so as to make the generated language more natural?

Pipeline Architecture



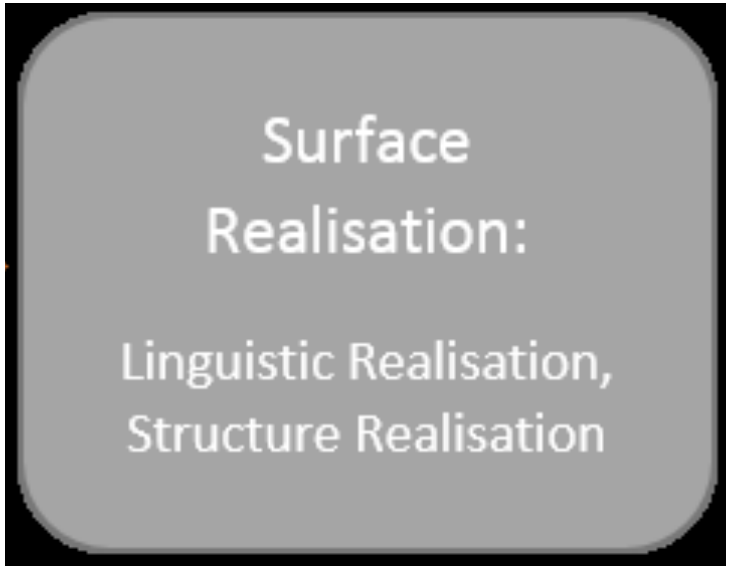
Document Planning

- Content Determination
  - entire ontology
- Document Structuring
  - Templates

Sentence Planning

- Investigation into this
- Referring expressions
  - pronouns
- Aggregation
  - and

Surface Realisation



- Linguistic Realisation
  - Applying grammar rules
- Structure realisation
  - text rewritten in HTML

Methodology

Iteratively investigating and building each component of the pipeline architecture

Evaluation

Grammar Engine - Ion

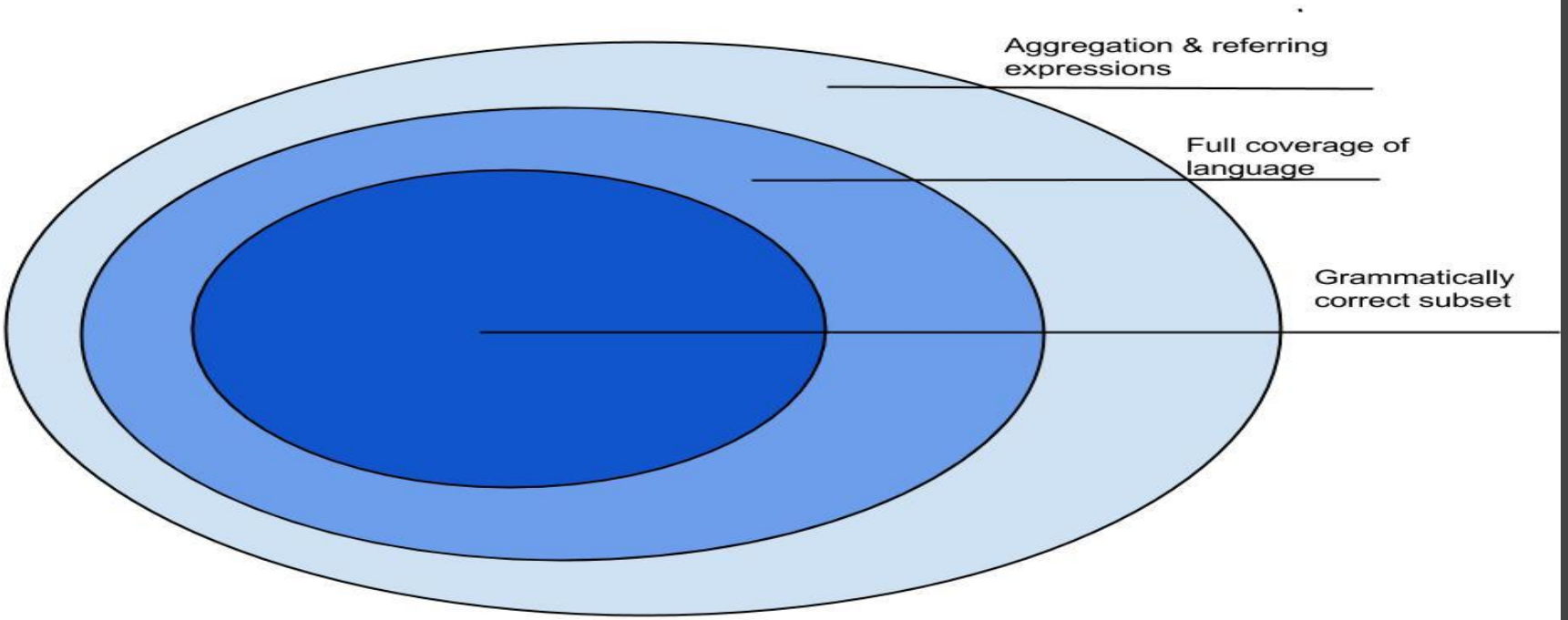
Grammar based approach:

- Formalise grammar rules
- Build up sentences based on these rules

Research Question

- Will the grammar engine approach be able to verbalise **all axioms in OWL 2 DL** into **grammatically correct Afrikaans** sentences?

Methodology



How?

Grammatical Framework:

- Abstract Syntax Tree
  - Captures important information to be verbalised
- Concrete Syntax Tree
  - Contains rules (eg sentence order) to convert abstract syntax tree into correct sentence.
- Functional programming language

Grammatical Framework continued

- Existing Afrikaans grammar files
  - Incomplete
  - Adjustments needed for full coverage
- Integrate OWL file with GF
- Integrate parser & translator

Evaluation

User Testing

- Create sentences using test ontologies
- Ask users to rate sentences based on given criteria:
    - Coverage
    - Understandability
    - Grammatical Correctness
    - (Lack of) Redundancy

Project Plan - Risks

Risks:

- Not granted ethical clearance
- Lack of linguistic knowledge
- Not all axioms are covered in sample ontology

Core Deliverables

- Template based approach - Lauren:
  - Template
  - Proof of concept verbaliser
  - Research into applying sentence planning
- Grammar Engine based approach - Ion:
  - Formalised grammar rules
  - Updated Grammar files
  - Proof of concept: Verbalise Afrikaans ontology using grammar engine.

Core Deliverables

- Afrikaans test ontology
- Basic web interface
- Comparison of results from different approaches

‘Nice to have’ Deliverables

- Implementation of Aggregation
- Implementation of Referring Expressions
- Ability to upload ontologies onto web interface
- Usable and user-friendly web interface

Thank you

Questions?