

<D2.1.2 Documentation of the Corpora>

ModelWriter

Text & Model-Synchronized Document Engineering Platform

Work Package: WP2

Task: T2.1 – Data Collection

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Apart from the deliverables which are defined as public information in the Project Cooperation Agreement (PCA), unless otherwise specified by the consortium, this document will be treated as strictly confidential.

Document History

Version	Author(s)	Date	Remarks
0.1.0	Claire Gardent, Mariem Mahfoudh	30-Aug-2015	Draft
1.0.0	<name>	<date>	Initial Release

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■ Role of the deliverable

This deliverable documents the data used to train, develop and test the NLP components (Semantic Annotator, Semantic Parser, Natural Language Generator) of ModelWriter. It might be updated during the project in case additional data is worked with.

■ Structure of the document

This document is organized as follows:

Section 1 introduces the document.

Section 2 describes for each use case: the scope and motivation, the approach and the available resources (corpora).

■ Terms, abbreviations and definitions

Abbreviation	Definition
NLG	Natural Language Generation
NLP	Natural Language Processing
RDF	Resource Description Framework
WP	Work Package
UC	Use Case

2. Introduction

The development and the evaluation of natural language processing systems required data: for training, for tuning and for testing. In the ModelWriter project, this includes textual data, knowledge data and ideally bi-texts i.e., aligned corpora of text and their corresponding knowledge representation.

Three data types are distinguished :

1. The texts that are technical documents describing the rules and the services of a company. They can be txt file, pdf file, java file, etc. and they can contain both text (words, sentences, ...) and pictures.
2. The models that are formal and structured representation of the technical documents (texts). They can be uml diagram, conceptual model, etc.
3. The knowledge bases that are an explicit specification of a conceptualization of a domain. They are a formal representation of domain knowledge and they can be RDF (Resources Description Framework) or OWL (Language Web Language) ontologies. The knowledge bases are used to identify and check the consistency of the links between text and model. They are also used to annotate both the text and model.

The Figure 1 represents the relations between the different types of data.

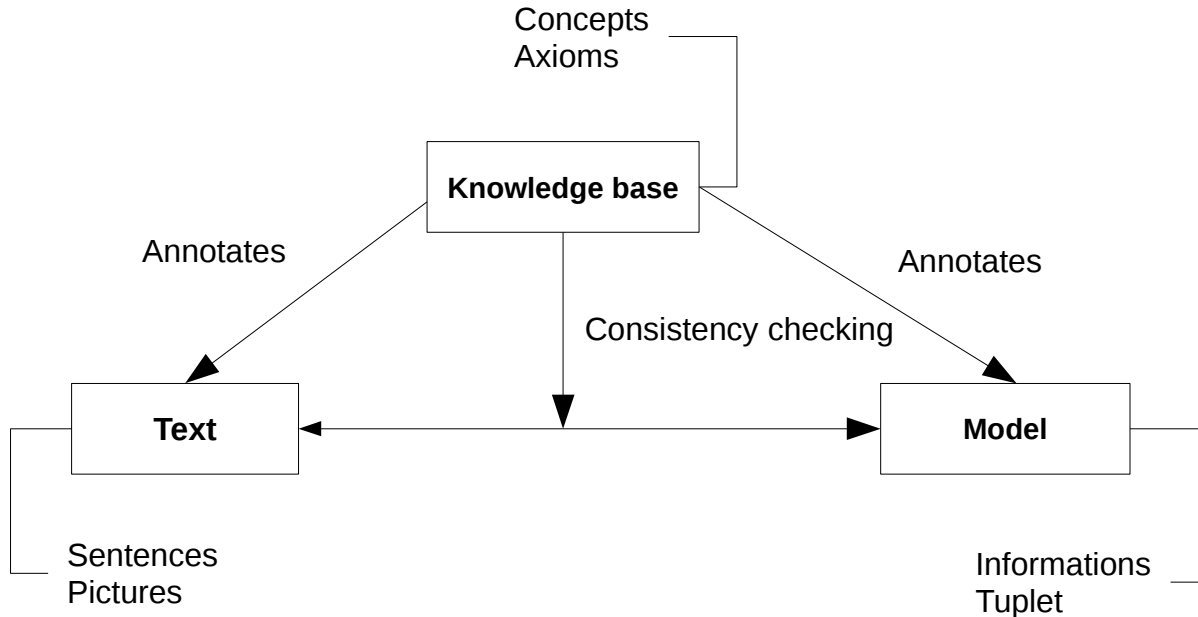


Figure 1: The relation of data composed the copora.

The rest of this document is organized as follows: section 2 represents the Airbus corpora. The section 3 describes the Obeo corpora. Finally, the section 4 shows the Turkish corpora.

Based on the use cases identified in WP1, we collected data to develop and evaluate three NLP tools necessary to achieve ModelWriter goals namely, a semantic annotator, a semantic parser and a natural language generator.

The *semantic annotator* is required to synchronised text and models. Its function is to annotate text with elements of the model whereby text elements may differ from model elements with respect to derivational (warn/Warning) or inflectional (pipe/Pipes) morphology , synonymy (pipe/tube) and/or syntax (procedure should be removed/procedureDeletion).

This data will then be used to identify the linguistic requirements set by the use cases; to train and test the semantic processors (parser and generator); and to acquire the language models useful for disambiguation (parsing) and fluency ranking (generation).

A *semantic parser* converts text into model representations. It can be used to extend the model (by adding to the current model the model expression representing the meaning of the parsed text) or to synchronise complex natural language expression with one or more model elements.

Conversely, a natural language generator maps model representations to text. It can be used to update a text which is synchronised with a model whenever this model is modified/extended.

3 Airbus Data

This section describes the Airbus corpora which is composed of a set of texts and a knowledge base (the model).

The Airbus use cases UC-FR4 and UC-FR5 target the synchronisation of Airbus SIDP (e.g. System Installation Design Principles) documents with an RDFS model.

The overall driving need for these two use cases is to reduce the time and the burden for the designers to consult a large set of regulation documents in order to retrieve design rules. Due to reasons such as technology push, process changes, etc., an increasing number of different regulation documents are issued by different stakeholders. They contain a high number of informal rules and the designers have difficulties following the information cascade and retrieving or rebuilding the correct information. This situation results in time waste, suboptimal designs and higher risks of error. In ModelWriter, our ultimate goal is to remedy this shortcoming by providing a synchronization mechanism between these documents and a model encoding the rules contained in these documents. This is an ambitious goal which in effect, requires building a semantic parser and a generator that can map arbitrary text into formal rules and vice versa. To achieve these goals, we gathered the following data.

3.1 Text

The text corpus is composed essentially of the System Installation Design Principles (SIDP). The SIDP documents are technical documents (doc files) that consists of various sets of regulations and directives about how to install a system or a set of systems in a functional area (e.g., electrical and optical system or Water Waste System). For each aircraft project, a set of such documents must be produced to ensure that the resulting system comply with the system requirements and take into consideration applicable regulations and procedures. Figure 2 presents an extract from a SIDP document. It shows a table which presents an example of component ("Bundle") with its definition and its picture. The definition specifies the rule that must be respected in the system installation of this component.

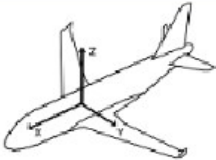

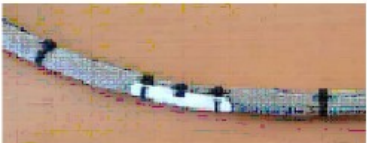
A/C axis		
Bundle	Group of wire/wires fastened together. Protection shall be considered as part of the bundle when they are used..	
		

Figure 2: An extract from a SIDP document.

We gathered two text corpora for developing and testing our NLP tools.

- SIDP document SIDP 92A001V. This SIDP document contains the system installation design principles applicable to the electrical and optical system installation. It provides an example of how design rules are formulated in SIDP documents and of how these documents are structured. The SIDP document SIDP 92A001 includes text and graphics and contains 6311 word forms. It is available in French-Consortium/airbus/text/SIDP92A001V.docx
- Semi-Structured SIDP rules. The Airbus System Installation team has built an SQL database of SIDP rules which encodes installation rules in a semi-structured format. In effect these rules provide a simplified, semi-normalised version of the rules contained in the SIDP documents thereby facilitating natural language processing (less diversity in the syntactic structures and lexicon, less ambiguity, rules formulated as one sentence rather than across several sentences, fewer anaphoric references etc). Table 1 shows an example of a tuple extracted from the database. It is a rule describing a segregation constraint holding between a pipe and an electrical route. This constraint is specified by Rule 1 and applies in Zone 1 of the functional area ATA38 (i.e., the water waste system).

We gathered these rules to develop a first version of the NLP tools (semantic annotator, semantic parser and text generator) that works on these semi-structured rules. Currently, the semi-structured rules available to the French consortium consists of 986 rules and 13178 word forms. These rules are available in two formats: an excel file whose columns are used to label each part of the rule (French-Consortium/airbus/text/rules.xls) and a text file where this labelling is ignored. (French-Consortium/airbus/text/rules.txt). The excel file is used to automatically construct an RDFS version of the rules while the text file is used to test the NLP tools.

ATA	Zone	Rule	Object	Auxiliary	Action Verb	Prep	Object 2
38	1	1	Pipe	Shall be	segregated	from	Electrical Route

Table1: A rule from model Airbus.

3.2 Model

Semantic Parsing maps text to meaning representations which can then be queried and synchronisation links text and model elements via semantic annotation To support both KB querying and synchronisation, Airbus manually developed a knowledge base modeling the

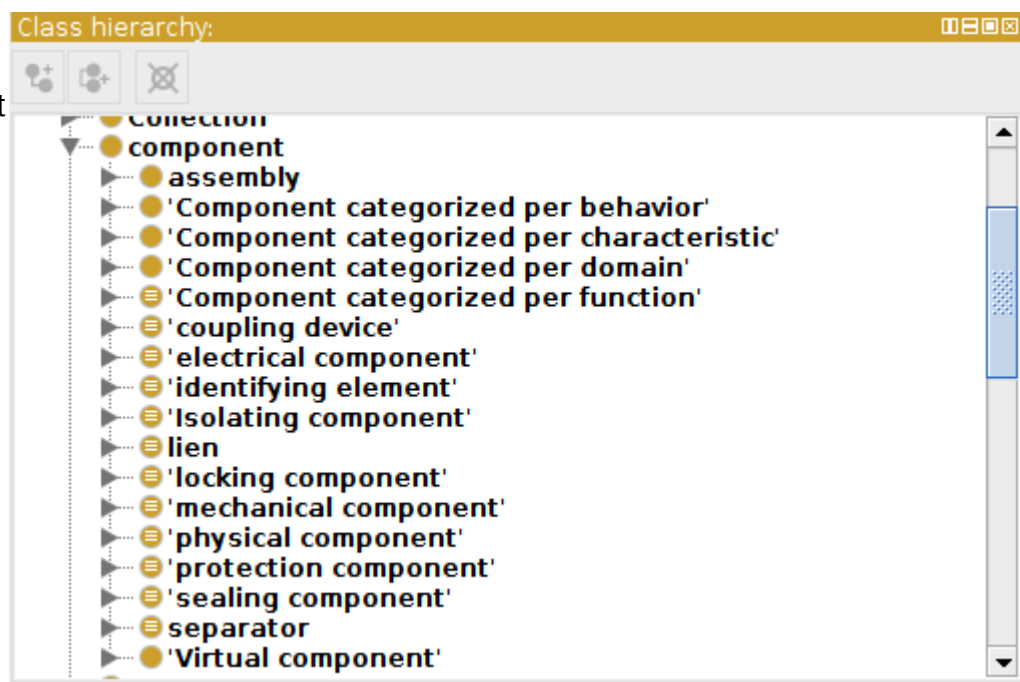
domain of SIDP92A001V namely the domain of the electrical and optical system installation.

This knowledge base is composed of a set of OWL ontologies manually constructing by experts working in Airbus company. The ontologies are represented by both OWL and SKOS (Simple Knowledge Organization Systems) languages.

Currently, two ontologies are fully developed (Rule and Component ontology), the others are under development.

1. The Rules ontology represents the SIDP rules concepts. It is an OWL-DL ontology and it is composed of more than 2400 concepts.
2. The Component ontology represents the system installation components used by Airbus. It is an OWL-DL ontology and it is composed of more than 2200 concepts. The Figure 3 presents an extract from this ontology.

Figure 3:
An extract
from



Component ontology.

The knowledge base is used in different tasks. First, it is used for the semantic annotation and synchronisation between text and model (e.g. link is synonym to attach). This is based on `rdfs:label` and `skos label` (`ref:label` and `alt:label`).

Second, the knowledge base is used to check the consistency checking of the created links using the ontologies axioms (e.g. `disjointWith`)

Because of confidentiality issues, the Airbus data could only be shared after a Non Disclosure Agreement was signed by all interested parties namely, all French partners. This agreement was finalised on June 1st and access to the data was given shortly thereafter.

During the first year of the project, we used this data as follows.

- The SIDP semi-structured rules were processed by CNRS/LORIA and by AIRBUS to automatically construct an RDFS knowledge base encoding the content of these rules.
- The domain specific KB was used by CNRS/LORIA for the semantic annotation of the SIDP rules. More generally, the current version of the semantic annotator can annotate arbitrary text with concepts from the domain specific KB developed by Airbus.
- The domain specific KB is also used to support SPARQL queries on the RDFS knowledge base automatically derived from the SIDP semi structured rules by allowing for e.g., subclass information to be taken into account. Suppose for instance that the KB includes the knowledge that hose pipes, electrical pipes and water pipes are all pipes, then a query asking for all SIDP rules involving a pipe will return rules involving not only pipes but also all rules involving hose pipes, electrical pipes and water pipes.

For the second year of the projet, the aim is twofold.

First, we plan to use the semantic annotator to annotate arbitrary text with KB concepts. The resulting annotated text will then be used as a basis to develop a semantic parser and a generator.

Second, we will investigate whether the parallel data-text corpus build for the SIDP semi structured rules can be used to train/develop a semantic parser capable of mapping SIDP rules contained in SIDP documents to RDFS models.

2.2 Obeo Data

To be filled by Obeo/Samuel

2.3 Turkish Data

To be filled by Mantis

Annex 1

The following summarizes the corpora (text, data and knowledge bases) developed and used by the ModelWriter project.

A1.1 Airbus Data

Example SIDP Document

<https://github.com/ModelWriter/French-Consortium/airbus/text/SIDP92A001V.docx>

Semi-structured design rules:

<https://github.com/ModelWriter/French-Consortium/airbus/text/rules.txt>

<https://github.com/ModelWriter/French-Consortium/airbus/text/rules.xsl>

Domain Model (RDFS Knowledge Base modelling plane components)

https://github.com/ModelWriter/French-Consortium/airbus/kb/airbusComponentsKB_03072015.rdf

RDF Knowledge Base derived from Semi-Structured Design Rules

<https://github.com/ModelWriter/French-Consortium/airbus/kb/rules.rdf>

@Anne: please upload the RDF KB derived by your stagiaires as rules.rdf in the repository listed just above this comment.

A1.2 Obeo Data

To be filled by Obeo/Samuel

A1.3 Turkish Data

To be filled by Mantis

1. Appendixes

2. Appendix 1

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