

Integrating written policies in Business Rule Management Systems

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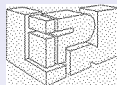
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The core structure

Acquiring a
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Results of
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Exploiting and
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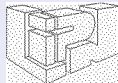
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The goals

rule applications



- ▶ providing a methodology and tools
- ▶ specifying at the business model level
- ▶ supporting users

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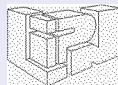
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- ▶ Knowledge elicitation
- ▶ More and more texts involved in BR are electronically available
- ▶ No fully automated extraction.

Existing:

- ▶ Either controlled input (O.P.A., SPARCLE, Attempto)
- ▶ or syntactic analysis + human translation (UPenn)

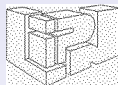
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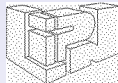
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- ▶ Separate phases for ontology and rules
 - ▶ Assisted and not automated work
 - ▶ Relying on
 - ▶ annotation of text
 - ▶ navigation in ontology / rules / text
- ▶ aimed at
 - ▶ acquiring the BR models,
 - ▶ explaining decisions (reference to texts rather than formal translation),
 - ▶ bringing models up to date when regulations change.

Two use cases:

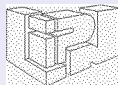
- ▶ AAdvantage use case (classification)
- ▶ Audi use case (conformance)



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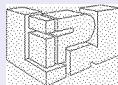
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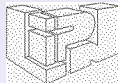
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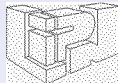
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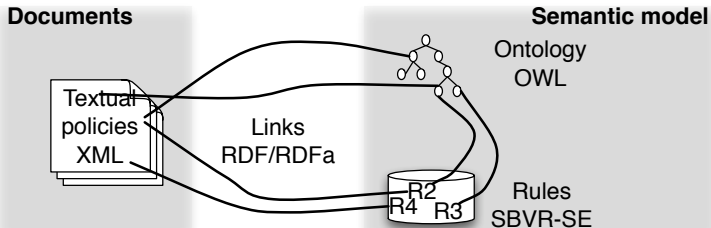
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Documented business rule model

- ▶ Progressively built during the acquisition phase
- ▶ Datastructure linking source document, ontology and rules - called index



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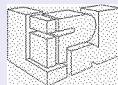
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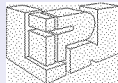
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- ▶ Document model
- ▶ Ontology model: OWL
- ▶ Rule model:
 - ▶ *Candidate* rules progressively refined
 - ▶ Functionnal classification: static constraint, operative rule, policy rule, ...
 - ▶ From plain english to structured english (SBVR-like)



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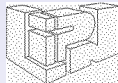
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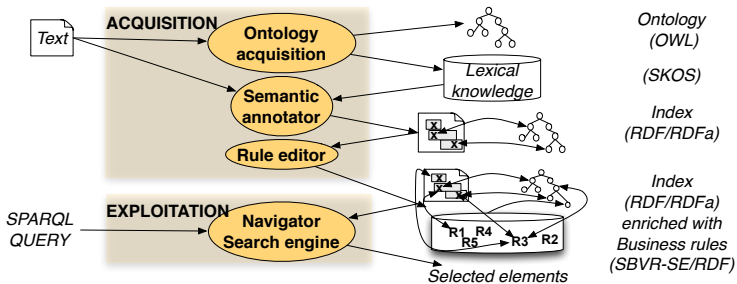
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Overall of the acquisition process



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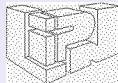
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Acquisition of a domain ontology

TERMINAE method

- ▶ Automatic extraction of the textual units.
e.g. *airline participant*, clustered with *Airline participant*, *participant*
- ▶ Normalizing \leftrightarrow a termino-conceptual network + linguistic properties
e.g. *participant*
 - ▶ linked to the termino-concept **Participant**
 - ▶ also linked to the termino-concept **Member**
- ▶ Formalization into a conceptual or ontological structure.
e.g. Creating two concepts: **Participant** son of **Company** and **Member** son of **Client**

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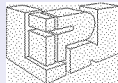
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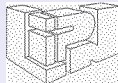
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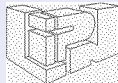
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A tool for the expert

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The screenshot shows the Terminae project AA interface. The main window is titled 'Terminae project AA' and has a menu bar with 'Perspective', 'Search', 'TerminoConceptual actions', and 'Help'. Below the menu bar are three tabs: 'Terminae Terminological level (Filtering-step 1)', 'Terminae Terminological level (Analysis-step 2)', and 'Terminae TerminoConceptual level'. The left pane shows a tree view of 'TerminoConcepts' with 'Sapphire' selected under the 'Person' category. The right pane is divided into several sections: 'TerminoConcept features' with a table of synonyms and links; 'NL Definition' with a text description; and 'Occurrences of a term' with a list of noun phrases and their occurrences in documents. A 'Domain' window is also visible on the right.

| Synonyms | Links |
|---------------------|--|
| AAdvantage platinum | Brother Brother Father |
| | Executive Platinum General AAdvantage Program Person |

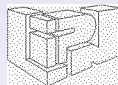
NL Definition
Sapphire is a title of a privilege for frequent fliers on American Airlines.

Occurrences of a term
Noun phrases
Occurrence 1:
ID occ2338 doc 0 sent 230
AAdvantage Platinum is equivalent to oneworld **Sapphire** .

Occurrence 2:
ID occ1012 doc 0 sent 242
AAdvantage Platinum and AAdvantage Gold members earn four 500-mile electronic upgrades for every 10,000 qualifying base miles flown (including guaranteed minimum miles) during your membership year (March 1 or the date you qualify for elite status , through the last day of February) .

Occurrence 3:

Figure: Termino-concept *Sapphire*



Annotating more texts

- ▶ Linguistic knowledge available in SKOS format
- ▶ can automatically cast annotations on new versions, added texts of the domain.

e.g.

Termino-concept ↔ *Label*

Adjusting device

↔ *adjusting device/belt adjustment device*

Low-temperature chamber

↔ *low-temperature chamber/refrigerated cabinet*

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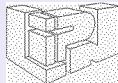
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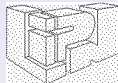
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Acquisition of business rules

- ▶ Strategy : analysis and exploration of the text.
- ▶ SemEx: another tool designed for rule progressive elicitation and exploration, supports the following steps:

semantic exploration

The screenshot shows the SemEx application window. On the left is a 'Hierarchy' tree with categories like Space, Source, Agent, Function, Attribute, Safety, Humidity, Temperature, Number, Device, Dimension, Conditioning, Method, VirtualMethod, and PhysicalMethod. The main area displays a corpus of text with semantic annotations. The text includes sections like 7.3. Micro-slip test, 7.3.1.1. [R1]The samples to be submitted to the micro-slip test shall be kept for a minimum of 24 hours in an atmosphere having a temperature of 20 + 5 C and a relative humidity of 65 + 5 per cent. [R11]The test shall be carried out at a temperature between 15 and 30 C. 7.3.2. It shall be ensured that the free section of the adjusting device points either up or down on the test bench, as in the vehicle. 7.3.3. [R18]A 5 daN load shall be attached to the lower end of the section of strap.[R18] The end shall be subjected to a back and forth motion, the total amplitude being 300 + 20 mm (see figure). 7.3.4. If there is a free end serving as reserve strap, it must in no way be fastened or clipped to the section under load. 7.3.5. It shall be ensured that on the test bench the strap, in the slack position, descends in a concave curve from the adjusting device, as in the vehicle. The 5 daN load applied on the test bench shall be guided vertically in such a way as to prevent the load swaying and the belt twisting. The attachment shall be fixed to the 5 daN

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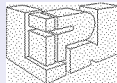
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- ▶ linguistic markers are emphasized
- ▶ select a rule → copy in a rule editor

The screenshot displays the SemEx application window. The 'Rule Editor' tab is active, showing a list of rules on the left and a detailed view of rule R25 in the center. The rule text in the editor is: 'In that case, when the dynamic test has been carried out for a type of vehicle it need not be repeated for other types of vehicle where each anchorage point is less than 50 mm distant from the corresponding anchorage point of the tested belt.' The right-hand pane contains a 'Parameters' section with fields for Type, Pattern, Premise, Conclusion, Revisions, Refers to (listing R24, R25, R26), Subrule of (listing R24, R25, R26), User name, and Editing date (06/02/2011). The bottom status bar indicates 'Type : Concept'.

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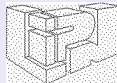
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- ▶ new versions are added to solve ambiguities, etc.
- ▶ a rule can be decomposed into several subrules

- R13 The test shall be carried out at a temperature between 15 and 30 C.
- R14 The micro_slip_test shall be carried out at a temperature between 15 and 30 C.
- R15 The temperature of the micro_slip_test must be between 15 and 30 C.
 - R17 The temperature of the micro_slip_test must be lesser than 30 C.
 - R16 The temperature of the micro_slip_test must be greater than 15

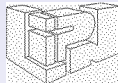
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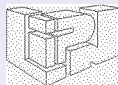
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Short documents (5750 and 3700 words) but hard to read

The ontology

| Use case | Concepts | Individuals | Roles |
|-------------------|----------|-------------|-------|
| <i>AAdvantage</i> | 210 | 25 | 74 |
| <i>Audi</i> | 77 | 31 | 19 |

The rules

| Use case | Initial rules | Revised rules | Decomposed rules | Total |
|-------------------|---------------|---------------|------------------|-------|
| <i>AAdvantage</i> | 101 | 0 | 0 | 101 |
| <i>Audi</i> | 40 | 27 | 16 | 83 |

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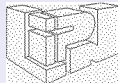
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Coverage

| Use Case | Ontology to text (O2T) | Ontology to rules (O2R) | Rule to Text (R2T) |
|-------------------|------------------------------|-------------------------------|--------------------------|
| <i>AAdvantage</i> | 46.4 % | 54.8 % | 41 % |
| <i>Audi</i> | 33.8% | 40 % | 33.8 % |

$$O2T = \frac{\# \text{ of annotated occurrences}}{\# \text{ of wd occurrences}} \text{ in the text}$$

$$O2R = \frac{\# \text{ of annotated occurrences}}{\# \text{ of wd occurrences}} \text{ in the rules}$$

$$R2T = \frac{\# \text{ of rule sentences}}{\# \text{ of sentences}} \text{ in the text}$$

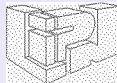
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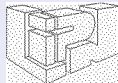
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Semantic search

- ▶ Traditional text search (words, structure if encoded)
- ▶ Ontology exploration
- ▶ Browsing the rule base
- ▶ Navigating from a resource to another
 - ▶ from concepts to sentences involving them
 - ▶ from concepts to rules involving them
 - ▶ between sentence and rules through common concepts

Used all along the acquisition

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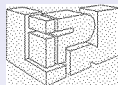
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SPARQL queries on the whole index

The screenshot shows the SemEx application interface. On the left, a SPARQL query is displayed in a text area. The query is as follows:

```
SPARQL query
PREFIX schema: <http://ipn.univ-paris13.fr/RCLN/schema#>
PREFIX audirules: <http://ipn.univ-paris13.fr/RCLN/ontorule/Audi/rules#>
select distinct ?rule ?content ?concept
where{
  audirules:R19 schema:annoted ?link.
  ?link schema:defineResource ?resource.
  ?resource schema:realizeConcept ?concept.

  optional{
    ?rule schema:ruleText ?content.
    ?rule schema:annoted ?textlink.
    ?textlink schema:defineResource ?resource2.
    ?resource2 schema:realizeConcept ?concept.
  }
}
ORDER BY ?rule
```

At the bottom left of the query area is a "Run query" button. On the right side of the application, the results of the query are displayed in a table-like format. The results are grouped by "result" numbers (1, 2, 3, 4) and include columns for "?concept", "?content", and "?rule". The results describe various concepts and their associated content and rules, such as "The number of results : 21", "If the strap breaks at or within 10 mm of either of the clamps then the TestOfBreakingStrengthOfStrip shall be invalid", and "If the strap slips then a new TestOfBreakingStrengthOfStrip shall be carried out on another strap."

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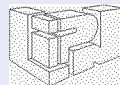
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Related tasks

- ▶ Support for consistency checking
 - Tracing back to the origin of inconsistency
 - Looking for some types of anomaly
- ▶ Maintenance
 - Updated regulations → impacted rules

Integrating
written policies in
Business Rule
Management
Systems

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Szulman

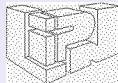
Introduction

The core structure

Acquiring a
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Conclusion

- ▶ methodology for Integration of the source text in a full platform (until execution) ;
- ▶ enables the business expert to build domain ontologies and BR ;
- ▶ relies on annotation as well as OMG and W3C standards ;
- ▶ builds a semantic space of sources, ontologies and rules ;

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