Table4OLD: A Tool of Managing Rules of Open Linked Data of Culture Event and Public Transport in Brussels

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Abstract. This paper records a brief description of an online tool and web service called Table4OLD (decision table for Open Linked Data, culturebrussels.appspot.com), with which we manage decision rules defined on top of domain ontologies. These decision rules are presented in the form of (semantic) decision tables. In the demonstration, we use a use case in the field of culture event and public transport in Brussels. We intend to show how easy a semantic decision table can be used as a user interface for non-technical people. In the meanwhile, it also gives enough technical transparency and modification possibilities to technicians and amateurs.

Keywords: ontology, Semantic Decision Table, Open Data, Linked Data, Open Linked Data, Knowledge Management.

1 Introduction

In the Open Semantic Cloud for Brussels (OSCB) project (www.oscb.be), a use case has been designed for detecting public transport means for a culture event. There are two domain ontologies – a culture event ontology developed with Agenda (www.agenda.be) and a public transport ontology developed with STIB/MIVB (www.mivb.be). We want to use semantic decision tables (SDT, [1]) to model decision rules for managing user preferences.

An SDT is a decision table enriched with formal domain semantics. It contains a tabular presentation, a set of binary fact types, constraints, dependency rules and operators over those fact types. In some cases, the fact types and constraints are the result of annotating a decision table.

Table 1 shows an example. It contain the semantics defined in the domain ontologies (see L1~4), table structural information (see L 5 and 11 etc.), and the value types of the decision items (see L 8~10). We include a meta-rule for this decision table, which is "IF the value of [PT Available] is [Y], THEN the value of [Show PT info.] should be [*]". This rule is modeled in Semantic Decision Rule Language (SDRule-L, [2]).

The meta-rule in an SDT can be used to check the consistency in the rules of a decision table. In this paper, we will not focus on this issue. We would rather focus on

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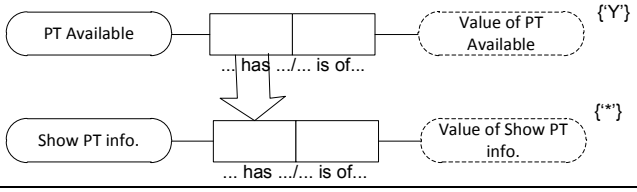
Table 1. An SDT of deciding whether or not to recommend a cultural event based on the price, language and availability of the public transport (PT)

Condition	1	2	3	4	5	6	7	8	9	10	11	12
Price	<=5						>5					
Language	EN		FR		NL		EN		FR		NL	
PT Available	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
Action												
Recommend	*	*					*				*	
Show PT info.	*		*		*		*		*		*	

Binary fact types

1	$\langle \gamma_1, Event, with, of, Price \rangle$	8	$\langle \gamma_3, Price, has\ value\ type\ of, is\ value\ type\ of, Float \rangle$
2	$\langle \gamma_1, Event, with, of, Language \rangle$	9	$\langle \gamma_3, Language, has\ value\ type\ of, is\ value\ type\ of, String \rangle$
3	$\langle \tilde{a}_1, Event, with, of, Address \rangle$	10	$\langle \tilde{a}_3, PTAvailable, has\ value\ type\ of, is\ value\ type\ of, Boolean \rangle$
4	$\langle \tilde{a}_2, Bus, connects, is\ connected\ by, Address \rangle$	11	$\langle \tilde{a}_3, Recommend, is\ a, is, ActionStub \rangle$
5	$\langle \tilde{a}_3, Price, is\ a, is, ConditionStub \rangle$		...

Meta-rules in SDRule-L [2]



the management issues of an SDT by considering it as a user interface for non-technical people. In the meanwhile, we also want our tool to give enough technical transparency and modification possibilities.

2 Design and Result

The functional design of Table4OLD is illustrated in **Fig. 1**.

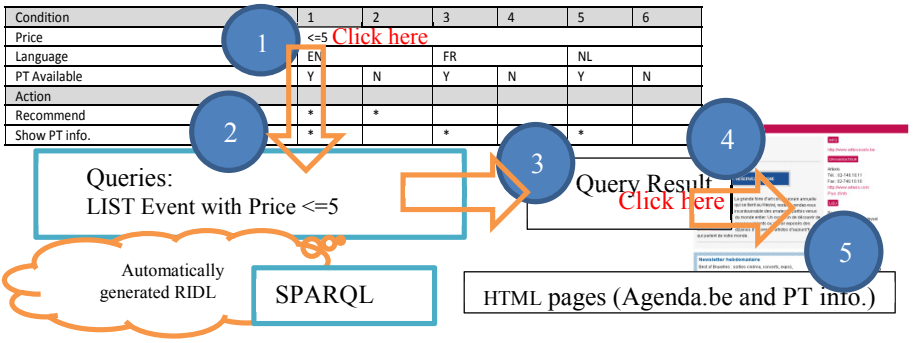


Fig. 1. Functional design of Table4OLD (5 steps)

Before allowing non-technical users to use Table4OLD, we, as knowledge engineers, have selected a few concepts from the domain ontologies and group them into two groups: *conditional* and *decisional*. A conditional concept often points to a web service that consumes data. A decisional concept often points to a web service that produces data.

Each SDT has a context, which is identified as a problem field. This context can as well be modelled as a concept in the domain ontologies. For instance, in the culture event ontology[1], the concept *Event* can be considered as a context. The concepts *Price* and *Language* are the two concepts considered conditional.

In this ontology, *Price* is linked to *Event* via an object property *Event_with_Price*, the domain of which is *Event* and the range of which is *Price*. The inverse property of *Event_with_Price* is *Price_of_Event*. Similarly, *Language* is linked to *Event* via an object property *Event_with_Language*, the inverse property of which is *Language_of_Event*.

The concept *PT Available* is defined in an application ontology[2]. It is linked to *Event* using *Event_with_PTAvailable* and *PTAvailable_of_Event*. It uses the object property *DetectPTAvailable_for_PTAvailable* to be further connected with *Detect PT Available*, which is a subtype of *Web Service*. The type of the value of *PT Available* is Boolean.

A user can build an SDT in Table4OLD by simply selecting conditional and decisional concepts. In the step of designing decision rules, he can make some meaningful combinations of those concepts. If a conditional concept has a value range, then Table4OLD will propose to use ranges. If the concept has disparate countable members, then it will propose the user with the choices. If the value of the concept is a Boolean value, then it will use "Y" and "N" automatically.

After the table has been created, he can use Table4OLD to check whether the decision rules are properly built by validating it against the domain ontologies and the semantics in any other shared models, such as the meta-rules defined in SDRule-L.

When the user clicks on a condition, for instance, "Price <= 5" in Table 1, Table4OLD will look at the open linked data from Agenda.be and provide a list of culture events that cost less than or equal to 5 euro. When he clicks on a column, e.g., column 1 in Table 1, a list of events that meet the conditions of "Price <= 5", "Language – EN", "PT Available – Y" is illustrated. What happened in Table4OLD in this scenario is as follows.

For each click, Table4OLD generates a SPARQL query. For instance, if the user clicks on "Price <=5", then the following SPARQL query is generated.

```
@prefix Onto: <http://starlab.vub.ac.be:8080/>
select ?event {
  ?event a Onto: Event.
  ?event Onto: Event_with_Price ?Price.
  Filter (?Price <= 5).
}
```

[1] http://www.starlab.vub.ac.be/website/files/agenda2012-07-13.owl

[2] http://www.starlab.vub.ac.be/website/files/publictransportapplicationV0.1.owl

As the result, the list of web pages will be shown to the user. If a link is clicked by the user, then he will be forwarded to the right web page at www.agenda.be.

Another possible scenario of using the SDT in Table 1 is as follows. A user can ask for the recommendations for future cultural events. For instance, if he specifies the time slot, e.g. within a week, then he will get a list of events with recommendations as illustrated in Table 2.

Table 2. A result of recommendation using Table 1

Event	Fired Rules	Action
Bruxelles Les Bains	1, 3, 5	**Recommended**, Metro 2, 6, Bus 51
Foire du Midi	1, 3, 5	**Recommended**, Metro 2, 6, Bus 3, 4, 51
Sinon la Famille ça va ?	9	Metro 1, 5, Bus 51
…	…	…

In Table4OLD, the results shown in Table 2 are decorated with other information from these events, such as images, logos and short descriptions. A hyper link to each event is a necessary.

3 Discussion and Conclusion

We have designed and implemented Table4OLD for culture events and public transports in Brussels. We use semantic decision tables (SDTs) to consume open linked data on the Web.

The SDTs in this paper are manageable and executable, meaning that all the decision items (conditions and actions) are linked to web services.

Table4OLD uses multiple domain ontologies. In the future, we need to study how non-technical end users can provide their "new" concepts to the conceptual models without making an extra effort.

References

[1] Tang, Y.: Semantic Decision Tables - A New, Promising and Practical Way of Organizing Your Business Semantics with Existing Decision Making Tools. LAP LAMBERT Academic Publishing AG & Co. KG, Saarbrücken (2010) ISBN 978-3-8383-3791-3

[2] Tang, Y., Meersman, R.: SDRule Markup Language: Towards Modeling and Interchanging Ontological Commitments for Semantic Decision Making. In: Chapter V (Section I) in Handbook of Research on Emerging Rule-Based Languages and Technologies: Open Solutions and Approaches. IGI Publishing, USA (2009) ISBN: 1-60566-402-2