

Candidate Tech: SWRL

W3C Workshop on Rules

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Interoperate with *what?*

- “Legacy” rules systems
 - Within rule “families”
 - E.g., ISO Prolog
 - Between rule “families”
 - E.g., RuleML
- The Non-Semantic Web
 - Standardize what?
 - HTTP/HTML/XML support?
 - XQuery as Functional/Logic Programming language?
 - Process languages? Web Services?
- The Semantic Web

The Semantic Web Requirement

- Rules for the Semantic Web
 - Conform to abstract principles
 - URI use, (perhaps) open world, XML syntax, distributability, layering/semantic compatibility
 - Conform to existing standards
 - RDF and OWL
 - SPARQL (not quite existing)
 - Various sorts of non-conformance
 - To a (small) subset of OWL (e.g., RDF, RDFS, DLP)
 - Different semantics (not just extensions)

OWL Compatibility

- Reuse existing ontologies
 - With their full expressivity
 - No shadow ontologies or radically incompatible extensions
 - OWL has (limited) rules!
- Augment existing ontologies
 - Extend OWL expressivity
- Four possibilities
 - Subset (DLP, Horn-*SHIQ*)
 - Hybrid (AL-Log, Carin, DL-Safe rules)
 - Superset (SWRL)
 - Alter (Classic style rules, other non-mon extensions)
- The first three are subsumed by SWRL*

SWRL

- Basic idea:
 - Horn rules where...
 - predicate functors are OWL-DL class, datatype, or property names
 - (class expressions can be used, in principle)
 - with first order semantics
 - (i.e., SWRL is a fragment of FOL)
 - XQuery inspired built-ins
- A hint:
 - `rdfs:subClassOf` and `rdfs:subPropertyOf` are syntactically restricted (material) implication
 - `ruleml:imp` generalizes these

Example DL KB

Computer \subseteq Product

Monitor \subseteq Product

Computer $\subseteq \exists \text{hasCPU.CPU}$

CPU $\subseteq \exists \text{hasSpeed.CPUSpeed}$

Customer \subseteq Person

SalesService = Service & $\exists \text{sells.Product}$

ExpensiveComputer = Computer &
 $\exists \text{hasPrice.HighPrice}$

AL-Log style

convenient(?cust, ?serv) :-

livesIn(?cust, ?loc), fastDelivery(?serv, ?loc),

Customer(?cust), **SalesService**(?serv).

(where no binary term appears in the OWL ontology, though they may be characterized by other AL-Log rules)

Carin style

discountAvailable(?cust, ?printer) :-
 previouslyBought(?cust, ?comp),
 sameBrand(?comp, ?printer),
 hasPrice(?comp, ?price),
 Customer(?cust), Printer(?printer),
 Computer(?computer), HighPrice(?price)

DL-Safety

- Given an OWL-DL ontology O and a Datalog program P :
 - A rule r is *strongly DL-safe* if each variable in r occurs in a non-DL atom in the rule body.
 - P is strongly DL-safe if all its rules are
- http://www.fzi.de/KCMS/kcms_file.php?action=link&id=484

SWRL in toto

- Only safety condition is standard Datalog safety
 - I.e., variables in the head must appear in the body
 - Merely syntactic; no expressive consequence
- No decision procedure
- No native reasoners (yet)
 - Translate-to-FOL & use full FOL reasoner (see Ian)
 - DL Safe rules covers a large (decidable) subset in a resolution framework
 - Convergence?
- Inferable rules (rule redundancy, specificity; query containment)

Some SWRLing Issues

- Syntax
 - The Semantic desperately needs a sane and extensible syntactic framework
 - Same-syntax semantic extensions won't cut it
- OWL Full
 - Some parts easy, some parts hard
 - (Some parts undesirable!)
- N-ary predicates
- Non-mon features
- Modularity
- SWRL vs. SWRL FOL

- <http://www.w3.org/Submission/2004/SUBM-SWRL-20040521/>
- <http://kaon2.semanticweb.org/>
 - Reduces The SHIQ description logic to disjunctive datalog; defines a horn fragment of SHIQ; defines DL Safety; has decidable metamodeling; good stuff!
- http://www.kr.tuwien.ac.at/staff/roman/asp_sw/
 - Different approach to combining DL with Datalog which admits negation-as-failure for the rules
- <http://www.w3.org/2004/12/rules-ws/paper/71>
 - Framework subsuming SWRL, plus pointers to more decidable subsets.
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