Supplementary Material

Table 1: Example of some common OWL 2EL constructs written using the Manchester syntax alonside an example of implementation using Brain.

Name	Description Logic	OWL (Manchester Syntax)	Brain implementation
Concepts			
atomic concept	A	Class: A	brain.addClass("A");
intersection	C⊓D	C and D	brain.equivalentClasses("A","C and D");
top concept	⊤	owl:Thing	brain.getOWLClass("Thing");
bottom concept	⊥	owl:Nothing	brain.getUnsatisfiableClasses();
union	C⊔D	C or D	Not supported (Not in EL profile)
complement	¬C	not C	Not supported (Not in EL profile)
existential restriction	∃$R.C$	P some C	brain.subClassOf("A", "P some C");
universal restriction	∀$R.C$	P only C	Not supported (Not in EL profile)
Roles			
atomic role	R	ObjectProperty: P	brain.addObjectProperty("P");
Individuals			
individual name	a	Individual: a	Not supported yet
Axioms			
TBox (terminological axioms)			
concept inclusion	C ⊑ D	C SubClassOf: D	brain.subClassOf("C", "D");
concept equivalence	C ≡ D	C EquivalentTo: D	brain.equivalentClasses("C", "D");
concept disjointness	C⊓D ⊑ ⊥	C DisjointWith: D	brain.disjointClasses("C", "D");
RBox (relational axioms)			
role inclusion	R ⊑ S	R SubPropertyOf: S	brain.subPropertyOf("R", "S");
role equivalence	R ≡ S	R EquivalentTo: S	brain.equivalentProperties("R", "S");
complex role inclusion	R1∘$R2$ ⊑ S	S SubPropertyChain: R1 o R2	brain.chain("R1 o R2", "S");
role transitivity	R ∘R ⊑ R	Characteristics: Transitive	brain.transitive("R");
ABox (assertional axioms)			
concept assertion	C(a)	a Types: C	Not supported yet
role assertion	R(a, b)	a Facts: R b	Not supported yet
individual equality	a = b	a SameAs: b	Not supported yet
individual inequality	a ≠ b	a DifferentFrom: b	Not supported yet

Table 2: The same query involving implicit knowledge retrieval is formulated using SQL and OWL over the Gene Ontology (GO). The original data comes from the website of the GO: http://www.geneontology.org/GO.downloads.database.shtml

	SQL	**OWL (via Brain)**
Source	go_daily-termdb-tables/	go_daily-termdb.owl
Access	http://www.berkeleybop.org/goose/	brain.learn("go_daily-termdb.owl");
Query: Explicit and implicit regulators of 'blood coagulation'	SELECT DISTINCT * FROM term INNER JOIN graph_path AS g ON (term.id=g.term1_id AND g.relationship_type_id=21) INNER JOIN term AS r ON (r.id=g.term2_id) WHERE term.name='blood coagulation' AND distance <> 0 ;	brain.getSubClasses("RO_0002211 some GO_0007596", false);
Method of retrieval	Iteration over additional tables storing all the possible links (closure graph)	Automated reasoning over the knowledge base using an abstract OWL expression