

1. construction of a TBox classification: Parse ontology and for each triple in it, add the respective fact to ASP program P .
 - $C \text{ rdf:type owl:Class: op}(C, \text{neg}C), \text{sub}(C, C)$
 - $R \text{ rdf:type owl:ObjectProperty: op}(R, \text{neg}R), \text{sub}(R, R), \text{op}(\text{ex}R, \text{negex}R), \text{sub}(\text{ex}R, \text{ex}R)$
 - $C \text{ rdf:type owl:subClassOf } D: \text{sub}(C, D)$
 - $R \text{ rdf:type owl:subPropertyOf } Q: \text{sub}(R, Q)$
 - $C \text{ owl:disjointWith } D: \text{sub}(C, \text{neg}D)$
 - $R \text{ owl:propertyDisjointWith } Q: \text{sub}(R, \text{neg}Q)$
 - $R \text{ rdfs:domain } Q: \text{sub}(\text{ex}R, Q)$

Further rules for P are:

$\text{sub}(X, Z):-\text{sub}(X, Y), \text{sub}(Y, Z).$

$\text{sub}(Y', X'):-\text{op}(X, X'), \text{op}(Y, Y'), \text{sub}(X, Y).$

$\text{conf}(X, Y):-\text{op}(X, Y), \text{sub}(X, Y).$

$\text{op}(X, Y):-\text{op}(Y, X).$

There will be a unique answer set of P , let it call A .
2. Given an external atom $cDL[c^+, c^-, r^+, r^-, Q](X)$ (concept query) and maximal extensions of its input predicates, construct a set of support sets \mathcal{S} for it in the following way. Compute all unary support sets:
 - for each $c^+(C, X)$:
 - If $\text{Tsub}(C, Q)$ is in A , then add $Tc^+(C, X)$ to \mathcal{S} ;
 - If $\text{conf}(C, C)$ is in A , then add $Tc^+(C, Y)$ to \mathcal{S} ;
 - for each $c^-(C, X)$:
 - If $\text{sub}(\text{neg}C, Q)$ is in A , then add $Tc^-(C, X)$ to \mathcal{S} ;
 - for each $r^+(R, X, Y)$:
 - If $\text{sub}(\text{ex}R, Q)$ is in A , then add $Tr^+(R, X, Y)$ to \mathcal{S} ;
 - for each $r^-(R, X, Y)$:
 - If $\text{sub}(\text{negex}R, Q)$ is in A , then add $Tr^-(R, X, Y)$ to \mathcal{S} ;
 - add $Q(X)$ to \mathcal{S} ;

Compute all support sets where the set of input predicates is empty:

 - If $\text{sub}(C, Q)$ is in A , then
 - * if C is of form $\text{ex}R$, add $R(X, Y)$ to \mathcal{S} ;
 - * otherwise add $C(X)$ to \mathcal{S}

Compute binary support sets:

 - for each $c^+(C, X)$:
 - If $\text{Tsub}(C, C')$ is in A then add $\{Tc^+(C, Y), \text{neg}C'(Y)\}$ to \mathcal{S} . If $c^-(C', Y)$ occurs in the maximal interpretation, then add $\{Tc^+(C, Y), Tc^-(C', Y)\}$.
 - for each $r^+(R, x, y)$:
 - If $\text{Tsub}(\text{ex}R, C)$ is in A then add $\{Tr^+(R, X, Y), \text{neg}C(X)\}$ to \mathcal{S} ;
 - If $\text{Tsub}(R, R')$ is in A then add $\{Tr^+(R, X, Y), \text{neg}R'(X, Y)\}$ to \mathcal{S} ;