Syntax

- N_I : Individual names
  Singular entities: Sun, Torleif, Excalibur
- N_C : Consept names
  Types, categories, or classes of entities: Mammal, Country, Organization, Yellow, English
- N_R : Role names
  Binary relationships: marriedWith, fatherOf, likes, locatedIn

RBox

Universal role *u* or for **r** or $\mathbf{r}^-$

Invert roles: $Inv(\mathbf{r}) := \mathbf{r}^-$ *and* $Inv(\mathbf{r}^-) := \mathbf{r}$

RIA: Role inclusion axiom

$r_1 \circ \ldots \circ r_n \sqsubseteq r$

Simple role inclusions: n=1

$\text{FatherOf} \sqsubseteq \text{ChildOf}^-$

S1: Every role r occurring in a RIA $r_1 \circ . . . \circ r_n \subseteq r$ where $n > 1$ is non-simple

S2: Every role r occurring in a simple role inclusion $s \subseteq r$ with a nonsimple *s* is itself non-simple.

S3: If r is non-simple then so is Inv(r).

S4: No other role is non-simple.

Restrict to the ones being **regular.**

$S \prec R$ iff $Inv(S) \prec R$, and

Every RIA is of one of the forms

R1 $r \circ r \sqsubseteq r$,

R2 $Inv(r) \sqsubseteq r$,

R3 $s1 \circ \ldots \circ sn \sqsubseteq r$,

R4 $r \circ s1 \circ \ldots \circ sn \sqsubseteq r$,

R5 $s1 \circ \ldots \circ sn \circ r \sqsubseteq r$, such that $r \in NR$ is a (non-inverse) role name r, and $si \prec r$ for $i = 1, \ldots, n$ whenever si is non-simple.

Rbox is regular if its role hierarchy is regular.

TBox

- Define concept expressions
- GCI: General concept axiom
  $C \subseteq D$
  «a cat is a mammal»
  $Cat \subseteq Mammal$
- Tbox is a finite set of GCIs

Every concept name C ∈ N_C is a concept expression

⊥(Rot 90deg) and ⊥ are concept expressions, called top concept and bottom concept, respectively

{a1, . . . , an} is a concept expression for every finite set {a1, . . . , an} ⊆ NI of individual names; concepts of this type are called nominal concepts

if C and D are concept expressions then so are ¬C (negation), C u D (intersection), C t D (union),

if r is a role and C is a concept expression, then ∃r.C (existential quantification) and ∀r.C (universal quantification) are also concept expressions

if r is a simple role, n is a natural number and C is a concept expression, then ∃r.Self (self restriction), >nr.C (at-least restriction), and 6nr.C (at-most restriction) are also concept expressions. The latter two are also jointly referred to as qualified number restrictions or cardinality constraints

ABox

Information that applies to single individuals

- C(a), called concept assertion,
- r(a, b), called role assertion,
- ¬r(a, b), called negated role assertion,
- $a \approx b$, called equality statement, or
- $a \not\approx b$, called inequality statement,

A STOIQ KB is the union of a regular Rbox, a Tbox, and an Abox. Given a KB with individual names, concept names and role names.