Exercises for AR@AI - Description Logics (I)

Modeling $\mathcal{ALC}$ concepts

Any artwork is created by an artist. A sculpture is an artwork. A painting is an artwork that is not a sculpture. A painter is someone who painted a painting. A sculptor is someone who sculptured an artwork and only create sculptures. If an artwork is created by an artist, he has either painted or sculptured it.

1. Determine the set of atomic concepts, and roles.

1. Solution:

   (a) Concepts: {   }
   (b) Roles: {   }

1. Model the following complex concepts in $\mathcal{ALC}$, using this vocabulary.

   (a) A piece of art that is not a sculpture
   (b) Someone, who painted a painting
   (c) Someone, who sculptured a piece of art, and only created sculptures.

1. Solution:

   (a) _____
   (b) _____
   (c) _____

Semantics of $\mathcal{ALC}$ concepts

2. Given the following base interpretation:

   - Δ={rembrandt, michelangelo, rodin, nightwatch, david,sixtChappel,thinker}

   - $Artwork^{\mathcal{I}}=$ {nightwatch,sixtChappel,thinker,david},
     $Artist^{\mathcal{I}}=$ {rembrandt,rodin,michelangelo}
     $Sculptor^{\mathcal{I}}=$ {rodin,michelangelo} $Sculpture^{\mathcal{I}}$={thinker,david}
     $Painter^{\mathcal{I}}=$ {rembrandt,michelangelo}
     $Painting^{\mathcal{I}}=$ {nightwatch,sixtChappel}
     $painted^{\mathcal{I}}=$ {(rembrandt,nightwatch),(michelangelo,sixtChappel),
     $sculptured^{\mathcal{I}}=$ {(rodin,thinker),(michelangelo,david}
     $created^{\mathcal{I}}=$ {(rembrandt,nightwatch),(michelangelo,sixtChappel),
       (michelangelo,david},(rodin,thinker)}

2. Compute the semantics of the following concepts:

   (a) $Artwork \sqcap \neg Sculpture$

   (b) $\exists painted.Painting$

   (c) $\exists sculptured.Artwork \sqcap \forall created.Sculpture$

   (d) $\forall created.Sculpture \sqcap \exists created.(Artwork \sqcap \neg Sculpture)$

   (e) $\forall created.Painting \sqcap \exists created.\top$

   (f) $\exists created.Painting$

3. Solution:

   (a) $(Artwork \sqcap \neg Sculpture)^{\mathcal{I}} = $ _____

   (b) _____

   (c) _____

   (d) _____

   (e) _____

   (f) _____